IV. MANAGEMENT GOALS

A. Definitions of Terms Used in This Plan IV-2
1. Elements IV-2
2. Goals and Objectives IV-3
3. Tasks and Adaptive Management Strategies IV-3

B. Biological Elements IV-4
1. Riverine and Riparian Habitat Element IV-6
2. Freshwater Wetland Habitat Element IV-11
3. Vernal Pool and Seasonal Pond Habitat Element IV-15
4. Annual Grassland Habitat Element IV-18
5. Oak Woodland Habitat Element IV-22

C. Biological Monitoring Elements IV-27
1. Riverine and Riparian Habitat Monitoring Element IV-30
2. Freshwater Wetland Habitat Monitoring Element IV-34
3. Vernal Pool and Seasonal Pond Habitat Monitoring Element IV-38
4. Annual Grassland Habitat Monitoring Element IV-40
5. Oak Woodland Habitat Monitoring Element IV-43

D. Public Use Elements IV-50
1. Public Access Information and Education Element IV-52
2. Hunting Element IV-53
3. Fishing Element IV-54
4. Day Hiking Element IV-55
5. Nature Observation Element IV-56

E. Balls Ferry Research and Education Center Conceptual Plan Elements IV-58
1. Sustainability and Strategic Planning Element IV-60
2. Research and Monitoring Coordination Element IV-61
3. Youth Educational Programs Development Element IV-62
4. Research and Education Facilities Use Element IV-63

F. Facility Maintenance Elements IV-67
1. Health and Safety Element IV-67
2. Fire Management IV-68
3. Vegetation Management and Grazing IV-69
4. Vector Control IV-71
5. Water and Flood Management IV-72
6. Access Roads, Parking and Trails IV-73
7. Signage, Fencing and Gates IV-74
8. Structures IV-75
9. Equipment IV-76

G. Cultural Resource Element IV-78

H. Resource Coordination Element IV-80

IV. MANAGEMENT GOALS

> The mission of the California Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

In developing management goals for the Mouth of Cottonwood Creek Wildlife Area (MCCWA), the California Department of Fish and Game (CDFG) must adhere to regulations specified in the California Fish and Game Code and the policies set forth by the California Fish and Game Commission. It must also maintain consistency with the goals and objectives of the CALFED Ecosystem Restoration Program (ERP), which is implemented by CDFG (CALFED 2000a). Both the California Fish and Game Commission and the CALFED ERP have policy directives designed to protect and preserve native non-listed species diversity, halt any significant species decline and assist with the recovery of at-risk native species.

In general, goals and tasks for the MCCWA are structured to promote best management practices and, where appropriate, are coordinated with larger regional planning goals. Full implementation of the MCCWA goals and tasks is contingent upon having adequate staff and operating budget.

Adaptive Management Approach to Climate Change

Wildlife area and ecological reserve managers are currently integrating climate change strategies in their proposed goals, operations and maintenance tasks on their sites. These include fuel reduction for habitat diversity or for adjacent residential and urban interface mandates; monitoring and control of exotic weeds and other invasives; water quality and conservation measures, purchase of water rights, and maintaining or enhancing in-stream flows; implementing best management practices for mosquito control in managed wetlands; acquisition and conservation planning to preserve wildlife corridors; creating larger buffer zones around wetlands; and coordinating management goals with other public agencies and non government organizations that have similar missions.

MCCWA management goals and tasks include strategies and best management practices to detect, monitor, evaluate and address climate-change-induced stressors, including weed and invasive species controls, wildfire fuel load prevention and reduction, water, habitat and corridor acquisition, conservation and enhancement measures, and management coordination with public and private agencies that share similar missions.

A. Definitions of Terms Used in This Plan

The Mouth of Cottonwood Creek Wildlife Area Land Management Plan has been developed in accordance with the California Department of Fish and Game's A Guide and Annotated Outline for Writing Land Management Plans (CDFG 2004a, 2007). The CDFG guide organizes management information and guidelines into elements, goals and tasks. Elements relate to broad categories of consideration, goals define the purposes within these elements, and tasks establish the specific actions required to attain the management goals. Together, elements, goals and tasks express the policy direction that guides the management of the Wildlife Area.

1. Elements

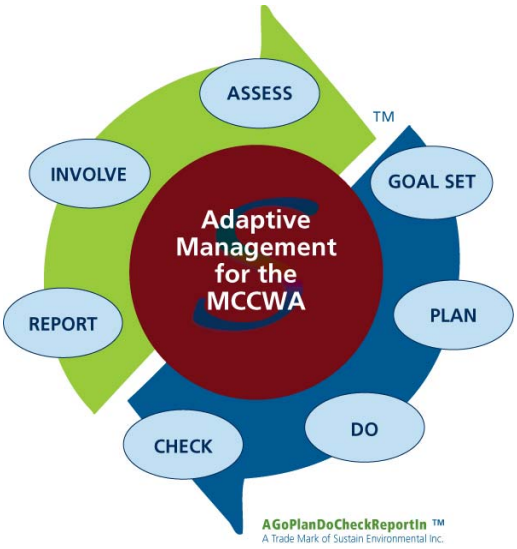
- **Element:** An element is any biological unit, monitoring and adaptive management strategy, public use activity, program development and planning effort, facility maintenance program, cultural resource protection activity, or resource coordination effort for which goals and objectives have been prepared and presented within this LMP.
- **Biological Element:** Biological elements refer to the habitat types (including their associated plant communities, wildlife and ecological processes) for which specific MCCWA management goals and objectives have been developed.
- **Biological Monitoring Element:** Biological monitoring elements refer to adaptive management strategies for continually improving the diversity, habitat integrity and environmental health of the biological elements identified in this LMP.
- **Public Use Element:** Public use elements include recreational opportunities, educational activities, and management programs appropriate to and compatible with the purposes for which the Wildlife Area was established and land acquired.
- **Balls Ferry Research and Education Center Conceptual Plan Element:** Balls Ferry Research and Education Center (BFREC) Conceptual Plan elements include research and educational activities that are linked to adaptive management strategies or to youth development programs and opportunities appropriate to and compatible with the purposes for which the Wildlife Area was established and land acquired.
- **Facility Maintenance Element:** The facility maintenance element refers to the conservation and maintenance program that supports and protects the multitude of resources and beneficial uses of the Wildlife Area.
- **Cultural Resource Element:** The cultural resource element refers to the protection of significant historical and archaeological resources that may be present on the units and that may yield information important to the prehistory or history of the MCCWA.
- **Resource Coordination Element:** The resource coordination element refers to any management activities that involve coordinating with public and private entities to improve species diversity, habitat integrity or environmental health within the Wildlife Area and region.

2. Goals and Objectives

- **Biological Goal:** A biological goal is a statement describing management and intended long-term results for a biological element.
- **Biological Monitoring Goal:** A biological monitoring goal is a statement describing adaptive management and intended implementation results for a phase of a biological monitoring element.
- **Public Use Goal:** A public use goal is a statement describing the type and level of public use that is compatible with the biological element goals specified in this LMP.
- **BFREC Conceptual Plan Goal:** A BFREC conceptual plan goal is a statement describing the type and level of planning and program development that is recommended to achieve the goals specified in the biological, biological monitoring and public use elements of this LMP.
- **Facility Maintenance Goal:** A facility maintenance goal is a statement describing the type and level of grounds and facility maintenance that is needed to attain the goals for the biological and public use elements specified in this LMP.
- **Cultural Resource Goal:** A cultural resource goal is a statement describing the management and intended results for the cultural resources element.
- **Resource Coordination Goal:** A resource coordination goal is a statement describing the type and level of management coordination activities that is needed to achieve the goals specified in this LMP.

3. Tasks and Adaptive Management Strategies

- **Tasks:** Tasks are the individual projects or work elements that implement the goals and objectives specified in this LMP. They should be used to develop both immediate and long-term operation and maintenance schedules and budgets for the MCCWA. Generally, tasks are listed in the order required to achieve the goal or objective.
- **Adaptive Management Strategies:** Adaptive management is a dynamic strategy in which management efforts are monitored regularly to assess their status and effectiveness. Adaptive management begins with collecting baseline data and testing long-term strategies for monitoring and evaluating changes to the baseline. Information and knowledge gained in this process are used to update management goals and tasks. The goal of adaptive management is continual improvement and long-term sustainability. An adaptive management approach has been applied to all elements within this LMP.



B. Biological Elements

The overall biological management goal for California Department of Fish and Game wildlife areas is to optimize ecological and habitat productivity for all species in balance with the needs of the public. To accomplish this, the department strives to protect and maintain the physical processes that contribute to the ecological productivity of its wildlife areas with an emphasis on habitat management programs.

HABITAT FOCUS

Biological elements addressed in this management plan focus on priority habitats at the Mouth of Cottonwood Creek Wildlife Area (MCCWA). Each element is introduced in the context of its ecological significance. The MCCWA's eight plant community types, as described in the previous section (IIIA), are grouped here into five biological elements that share common management strategies (Table IV-a).

Table IV-a. Crosswalk of Biological Elements and Plant Communities at the MCCWA

Biological Element	MCCWA Plant Communities
Riverine and Riparian Habitat Element	Great Valley mixed riparian forest Cottonwood Creek floodplain
Freshwater Wetland Habitat Element	Freshwater emergent wetland and pond (includes natural and created wetlands, ponds, stream channels and ditches) Seep
Vernal Pool and Seasonal Pond Habitat Element	Vernal pool / swale / seasonal pond
Annual Grassland Habitat Element	California annual grassland Grassland-riparian transitional habitat Ruderal (particularly Himalayan blackberry)
Oak Woodland Habitat Element	Valley oak savanna Valley oak and mixed riparian forest transitional zones

Biological elements are further broken down into goals and tasks that are organized around improving the three major aspects of functionally dynamic ecosystems:

- *Biological Diversity Goals.* These goals aim at improving the composition of species within the habitat type, including rarity, abundance, richness and connectivity.
- *Habitat Integrity Goals.* These goals aim at improving the structural diversity and environmental relationships within the habitat type, including maintenance and restoration of conditions that support biological diversity.
- *Environmental Health Goals.* These goals aim at improving environmental conditions of the habitat, including the water, air and soil quality.

Goals and tasks address conditions both within the MCCWA and within the larger ecological landscape. Many tasks are necessarily broad due to the lack of baseline data. Tasks related to surveys, mapping, monitoring, and regional coordination are discussed with more specificity in the Biological Monitoring Element (IVC). Specific tasks related to controlling invasive non-native species are described in the MCCWA Weed Management Plan (Appendix D) while tasks related to grazing as a vegetation management tool are discussed under MCCWA Grazing Plan and Management Guidelines (Appendix E). A discussion of the environmental impacts and mitigation associated with the proposed management goals and activities as outlined in this document is provided in the California Environmental Quality Act Checklist (Appendix F).

SPECIAL STATUS SPECIES

Management goals for special-status species are addressed within each habitat type, reflecting the focus of the CDFG on strengthening ecosystem integrity to promote species diversity. Protecting habitat for special-status species is given first priority in recognition of the landscape level needs of rare and endemic species. These goals are based on the stated purpose of the land acquisition by the California Wildlife Conservation Board (WCB), the California Fish and Game Code, the policies of the California Fish and Game Commission, and the CALFED Ecosystem Restoration Program goals and objectives. Internal CDFG coordination for California Endangered Species Act will occur for listed species before any MCCWA activities are undertaken that may potentially impact threatened or endangered species or habitat. Consultation with U.S. Fish and Wildlife Service (USFWS) will also occur when warranted due to a federal nexus via permitting or funding requirements.

What is "Critical Habitat"?

"Critical habitat" is a designation under the federal Endangered Species Act (ESA). The federal government is required to designate critical habitat for any species it identifies as threatened or endangered. Specifically, critical habitat is defined as:

> 1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and
>
> 2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

All federal agencies must ensure that any actions they authorize, fund or carry out are not likely to jeopardize the continued existence of a listed species, or *destroy or adversely modify its designated critical habitat.* These complementary requirements apply only to federal agency actions, and the latter only to habitat that has been designated. A critical habitat designation does not set up a preserve or refuge, and applies only when federal funding, permits or projects are involved. Critical habitat requirements do not apply to citizens engaged in activities on private land that does not involve a federal agency.

1. Riverine and Riparian Habitat Element

PHOTO: Cottonwood Creek floodplain and riparian corridor near its confluence with the Sacramento River. July 2005, SEI

Natural floodplain ecosystems are a product of, and adapted to, highly variable hydrologic regimes that are typified by droughts, catastrophic floods and frequent periods of inundation, and are expressed across a variety of temporal scales (seasons, years, decades). This hydrologic variability is an essential ecological process that functions to maintain the complex ecological features within aquatic, riparian, and wetland ecosystems. Historically, winter and springtime flooding created extensive flooded plains. Such flooding is critical to the maintenance of riparian forests, once the predominant floodplain vegetation in the Sacramento Valley.

For most of California's rivers, this natural hydrologic regime has been altered by dams and levees that have altered the timing and magnitude of flows. As one of the few remaining undammed tributaries to the Sacramento River, Cottonwood Creek provides a major source of gravel recruitment and a high quality water supply to the Sacramento River (CALFED 2000). It also provides a critical resource for anadromous and native fish species. The mouth of Cottonwood Creek is a prime example of a natural floodplain with an extensive riparian habitat assemblage.

Riparian habitat in California is one of the most productive and valuable habitats for all forms of wildlife and also one of the most threatened habitats, with only about 5% of the state's original riparian habitat remaining (ibid.). Riparian habitat provides food, nesting habitat, cover and migration corridors. Over 135 species of California birds such as the willow flycatcher, yellow-billed cuckoo and red-shouldered hawk either completely depend upon riparian habitats or use them preferentially at some stage of their life history. Another 90 species of mammals, reptiles, invertebrates and amphibians such as California red-legged frog, valley elderberry longhorn beetle and riparian brush rabbit depend on California's riparian habitats. Riparian habitat also provides riverbank protection, erosion control and improved water quality, as well as numerous recreational and esthetic values (RHJV 2004).

Neotropical migratory birds are those that breed in or migrate through the United States, at least to some extent, and spend the non-breeding season in Mexico, Central America, the Caribbean, and/or South America. Regionally, there have been substantial losses of historic habitat used by neotropical migrants, and information from the annual Breeding Bird Survey* suggests that the population levels for many of these species are declining (Sauer et al. 2008). Those neotropical migrants that rely upon riparian habitat for nesting have been particularly hard hit. Opportunities to increase the extent and density of riparian vegetation at the Cottonwood Creek and the Balls Ferry units will especially benefit neotropical migrants.

A local watershed group has been spearheading local efforts to restore habitat and improve flow regimes throughout the Cottonwood Creek watershed. Among its endeavors are development and implementation of a watershed management plan, a watershed-level fire management plan, a watershed-level erosion inventory, a historical analysis of the Cottonwood Creek hydrology, and funding for environmental education focused on water quality and watershed health (CCWG 2005). These efforts have resulted in an increase in the historic return of small Chinook salmon spawning runs in the lower creek in recent years. Continued efforts are ongoing to address remaining limiting factors through additional collaborative restoration planning and implementation. The CDFG supports continued restoration efforts in the Cottonwood Creek watershed, especially those opportunities that exist in the lowermost segment of Cottonwood Creek where it runs through the MCCWA.

Riverine and riparian habitats are under stress from a number of factors, including changes in the timing and extent of flooding regimes, conversion to agriculture, gravel mining, grazing, and non-native invasive plant species. There are several invasive non-native plant species that may adversely affect the health and productivity of riparian habitats, including Himalayan blackberry.

* The dynamic nature of the Internet and changing technology may cause hyperlinks embedded in this document to become inactive. A list of the URLs originally connected to the hyperlinks in this document is on file with CDFG North Coast Region headquarters.

BIOLOGICAL DIVERSITY GOALS

GOAL 1.1: Protect essential habitat for special-status species that occur in riverine and riparian habitats within or adjacent to the Wildlife Area.

TASK 1.1.1: Identify, map and protect essential habitat for the following special-status species *known or highly likely to occur* in riverine and riparian habitats within and adjacent to the Wildlife Area (IIIC):

- Fox sedge
- Valley elderberry longhorn beetle
- Chinook salmon
- Steelhead
- Northern Pacific pond turtle
- Common loon
- Bald eagle
- Ringtail

TASK 1.1.2: Conduct presence/absence surveys for special-status species that have the potential to occur but are not known to occur in riverine and riparian habitats within and adjacent to the Wildlife Area (IVC1.1.3).

TASK 1.1.3: Ensure that actions comply with the federal and state endangered species acts and other regulations aimed at the protection of special-status species.

TASK 1.1.4: Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species (IVC1.2.1).

GOAL 1.2: Protect and manage riverine and riparian habitat for species abundance and richness.

TASK 1.2.1: Complete a wildlife species inventory of riverine and riparian habitats.

TASK 1.2.2: Conduct breeding bird survey in riverine and riparian habitats to establish baseline for species diversity (IVC1.1.6).

TASK 1.2.3: Monitor the distribution and relative abundance of breeding riparian birds on an annual basis as an indicator of diversity within riverine and riparian habitats on and adjacent to the Wildlife Area (IVC1.2.2).

GOAL 1.3: Maintain and improve connectivity in riverine and riparian habitats.

TASK 1.3.1: Assess connectivity within and between riverine and riparian habitats on, adjacent to and nearby the Wildlife Area.

TASK 1.3.2: Explore easements, acquisitions and memoranda of understanding (MOU) with neighboring landowners to manage and restore the riparian corridor.

HABITAT INTEGRITY GOALS

GOAL 1.4: Prevent further loss of biological integrity within riverine and riparian habitats in the Wildlife Area.

TASK 1.4.1: Limit removal of invasive, undesirable non-native species to manual, low intensity methods until presence/absence surveys for special-status species is completed.

TASK 1.4.2: Inventory and map distributions of invasive non-native plant populations and integrate data into the GIS database (IVC1.1.7).

TASK 1.4.3: Implement the MCCWA Weed Management Plan (Appendix D) after conducting presence/absence surveys for special-status species and mapping invasive non-native plant populations.

TASK 1.4.4: Monitor the effectiveness of grazing as a vegetation management tool within the riparian areas (Appendix E) and adapt as needed

TASK 1.4.5: Collaborate with neighboring landowners in implementing habitat management practices that will strengthen the integrity of riverine and riparian habitats in and adjacent to the Wildlife Area.

GOAL 1.5: Maintain and manage critical habitat (as defined by the federal ESA) within riverine and riparian habitats in the Wildlife Area.

TASK 1.5.1: Coordinate with USFWS regarding management of critical habitat for listed species potentially occurring within riverine and riparian habitats of the Wildlife Area, including:

- Valley elderberry longhorn beetle
- Spring run salmon
- Steelhead
- California red-legged frog
- Western yellow-billed cuckoo

TASK 1.5.2: Continue to collaborate with local watershed groups (Appendix H) in their efforts to facilitate watershed restoration and protection to reduce water temperature and sedimentation to improve holding, spawning and rearing habitats for salmonids.

GOAL 1.6: Protect and manage riparian forests to promote structural diversity and density of the understory.

TASK 1.6.1: Set up permanent plots for annual vegetation monitoring (IVC1.1.1).

TASK 1.6.2: Set up permanent monitoring stations for annual photo monitoring of habitat (IVC1.1.2).

TASK 1.6.3: Conduct a detailed, plot-based classification of the riparian forests on the site to identify distinct subtypes based on canopy composition and microhabitat factors.

TASK 1.6.4: Identify target riparian restoration areas based on detailed mapping and community relationships.

TASK 1.6.5: Develop a riparian habitat restoration plan for MCCWA in conjunction with other regional planning efforts (IVC1.3.1; Appendix H).

GOAL 1.7: Maintain and enhance natural environmental functions of the Cottonwood Creek floodplain.

TASK 1.7.1: Review historic information on natural processes and conditions within the Cottonwood Creek floodplain and identify areas where natural functions have been lost.

TASK 1.7.2: Assess capacity for restoring or mimicking natural functions to improve habitat integrity.

ENVIRONMENTAL HEALTH GOALS

GOAL 1.8: Improve environmental health of the riverine and riparian ecosystem.

TASK 1.8.1: Conduct baseline benthic macro invertebrate (BMI) sampling along Cottonwood Creek (IVC1.1.8).

TASK 1.8.2: Sample and analyze water quality along Cottonwood Creek (IVC2.1.9).

TASK 1.8.3: Establish baseline inventory of riparian bird focal species based on breeding bird surveys (IVC1.1.6).

TASK 1.8.4: Annually monitor focal bird species as an indicator of riparian environmental health surveys (IVC1.2.2).

TASK 1.8.5: Conduct annual surveys to monitor BMIs along Cottonwood Creek (IVC1.2.4).

TASK 1.8.6: Assist neighboring landowners as needed with reducing off-site sources of pollutants in riverine and riparian habitats within the Wildlife Area.

TASK 1.8.7: Continue to work cooperatively with the Western Shasta Resource Conservation District and other agencies and groups to enhance and restore Cottonwood Creek ecological functions (IVH; Appendix H).

2. Freshwater Wetland Habitat Element

PHOTO: Freshwater emergent wetland on BFW1. May 2006, SEI

Freshwater emergent wetlands are among the most productive wildlife habitats in California. They provide food, cover and water for more than 225 species of birds (RHJV 2004), and numerous mammals, reptiles and amphibians. The protection of wetland habitats was the impetus for the acquisition of the MCCWA, particularly the Balls Ferry wetlands units. Created and naturally occurring wetland habitats occupy approximately 16% of the MCCWA. This biological element includes freshwater emergent wetland, natural and created ponds, streamside, and seeps.

The MCCWA supports a variety of freshwater emergent wetland types encompassing approximately 163 acres. The two Balls Ferry units provide particularly well developed wetlands, with extensive stands of bulrushes, sedges and cattails. This vegetation type is suitable for rails and bitterns and also important for nesting grebes and some passerine birds. Special-status wildlife that are potentially dependent on freshwater emergent habitat at MCCWA for breeding, foraging or loafing include Northern Pacific pond turtle, bald eagle, American white pelican, least bittern, and tricolored blackbird.

BIOLOGICAL DIVERSITY GOALS

GOAL 2.1: Protect essential habitat for special-status species that occur in freshwater wetlands within or adjacent to the Wildlife Area.

TASK 2.1.1: Identify, map and protect essential habitat for the following special-status species *known or highly likely to occur* in freshwater wetlands within and adjacent to the Wildlife Area (IIIC):

- Fox sedge
- Valley elderberry longhorn beetle
- Northern Pacific pond turtle
- Greater white-fronted goose
- American white pelican
- Least bittern
- Bald eagle
- Greater sandhill crane
- Yellow-breasted chat
- Tricolored blackbird
- Yellow-headed blackbird

TASK 2.1.2: Conduct presence/absence surveys for special-status species that have the potential to occur but are not known to occur in freshwater wetlands within and adjacent to the Wildlife Area (IVC2.1.3).

TASK 2.1.3: Ensure that actions comply with the federal and state endangered species acts and other regulations aimed at the protection of special-status species.

TASK 2.1.4: Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative (IVC2.2.1).

GOAL 2.2: Protect and manage freshwater wetlands for species abundance and richness.

TASK 2.2.1: Complete a wildlife species inventory of freshwater wetlands.

TASK 2.2.2: Conduct monthly surveys of wetland-dependent birds to establish a baseline for species diversity for one year (IVC2.1.5).

TASK 2.2.3: Conduct surveys in early spring and summer to document chorusing frogs, egg-masses, tadpoles, and juveniles (IVC2.1.6).

TASK 2.2.4: Monitor the distribution and relative abundance of wetland-dependent birds on an annual basis as an indicator of species diversity within freshwater wetlands on and adjacent to the Wildlife Area (IVC2.2.2).

GOAL 2.3: Maintain and improve connectivity for freshwater wetlands.

TASK 2.3.1: Assess connectivity within and between freshwater habitats on, adjacent to and near the Wildlife Area.

TASK 2.3.2: Explore easements, acquisitions and MOU with neighboring landowners to manage and restore contiguous wetlands.

HABITAT INTEGRITY GOALS

GOAL 2.4: Prevent further loss of biological integrity within freshwater wetland habitats in the Wildlife Area.

TASK 2.4.1: Limit removal of invasive, undesirable non-native species to manual, low intensity methods until presence/absence surveys for special-status species is completed.

TASK 2.4.2: Inventory and map distributions of invasive non-native plant populations and integrate data into the GIS database.

TASK 2.4.3: Implement the MCCWA Weed Management Plan (Appendix D) after conducting presence/absence surveys for special-status species and mapping invasive non-native plant populations.

TASK 2.4.4: Monitor the effectiveness of grazing as a vegetation management tool on wetland areas (Appendix E) and adapt as needed.

TASK 2.4.5: Collaborate with neighboring landowners in implementing habitat management practices that will strengthen the integrity of freshwater wetland habitats in and connected to the Wildlife Area.

GOAL 2.5: Maintain and manage critical habitat within freshwater wetlands in the Wildlife Area.

TASK 2.5.1: Coordinate with USFWS regarding management of critical habitat for listed species potentially occurring within freshwater wetland habitats of the Wildlife Area, including

- Valley elderberry longhorn beetle
- California red-legged frog

GOAL 2.6: Maintain, protect, enhance and restore freshwater wetland habitat types.

TASK 2.6.1: Set up permanent plots for annual vegetation monitoring (IVC2.1.1).

TASK 2.6.2: Set up permanent monitoring stations for annual photo monitoring of habitat conditions (IVC2.1.2).

TASK 2.6.3: Refine habitat mapping as physical access allows.

TASK 2.6.4: Identify and prioritize appropriate wetland areas for enhancement and restoration.

TASK 2.6.5: Maintain early successional freshwater emergent wetland habitat types by:

- Implementing a long-term maintenance program for freshwater marsh habitats through the use of mowing, prescriptive fire, disking, grazing, or water level manipulation during the non-nesting season to maintain optimal waterfowl habitat.
- Removing invasive water plants during the non-nesting season (Appendix D).
- Maintain varying amounts of thatch within emergent marsh vegetation to provide habitat for nesting birds.

GOAL 2.7: Maintain and enhance natural environmental functions of freshwater wetlands within the Wildlife Area.

TASK 2.7.1: Review historic information on wetland conditions within the Wildlife Area and assess the loss of natural hydrological functions on the integrity of natural habitats, including the impact on valley oaks.

TASK 2.7.2: Maintain, as appropriate, consistent water levels to provide high quality habitat for floating nest builders.

TASK 2.7.3: Identify areas where nesting boxes may contribute to habitat restoration in freshwater wetlands.

TASK 2.7.4: Identify areas where appropriate soil and hydrological conditions exist for creating additional wetlands and, where appropriate, use impounded water and/or water control structures to create additional wetlands.

ENVIRONMENTAL HEALTH GOALS

GOAL 2.8: Improve environmental health of the freshwater emergent wetlands.

TASK 2.8.1: Conduct BMI surveys in all freshwater emergent wetlands to establish a baseline data for making decisions about wetland management (IVC2.1.8).

TASK 2.8.2: Establish baseline condition for water quality by sampling and analyzing water in freshwater wetland habitats (IVC2.1.9).

TASK 2.8.3: Conduct monthly surveys of wetland-dependent birds for at least one full year to establish baseline diversity (IVC2.1.5).

TASK 2.8.4: Annually monitor focal species as an indicator of freshwater wetland health (IVC2.2.2)

TASK 2.8.5: Annually monitor BMIs and water quality in freshwater emergent wetlands (IVC2.2.4).

TASK 2.8.6: Assist neighboring landowners with reducing off-site sources of pollutants in freshwater wetlands within the Wildlife Area.

TASK 2.8.4: Continue to work cooperatively with the Western Shasta Resource Conservation District and other agencies and groups to enhance and restore wetland ecological functions (IVH; Appendix H).

3. Vernal Pool and Seasonal Pond Habitat Element

PHOTO: Elongated swales north of the large perennial pond on BFW1. July 2005, SEI

Vernal pool habitats are considered a "high priority" habitat type under the California Natural Diversity Database (CDFG 2003a). Vernal pool habitats are endemic to the Central Valley and provide habitat for several threatened and endangered invertebrates, including vernal pool fairy shrimp and vernal pool tadpole shrimp, and sensitive amphibians such as the California tiger salamander (*Ambystoma californiense*) and western spadefoot toad *(Spea hammondii).* An estimated 2.8 million acres of California's vernal pools have been destroyed (over 66%); most of the remaining intact pools are on higher terraces. Migrating waterfowl are often observed feeding and resting in Central Valley vernal pools. Recent studies suggest that the protein-rich invertebrates and crustaceans, as well as the roots and leaves of vernal pool plants provide an important seasonal food source for waterfowl as well as other non-migratory bird species (San Joaquin County RCD 2002).

Two elongated low-lying areas north of the large pond on the Balls Ferry Wetland Unit 1 (BFW1) are inundated during early season, and then dry out completely in the spring. These areas support a distinctive assemblage of mostly native species characteristic of vernal pools and similar vernally wet habitats. This habitat is approximately 2 acres in extent.

BIOLOGICAL DIVERSITY GOALS

GOAL 3.1: Protect the essential habitat for special-status species associated with vernal pools and other seasonal wetlands on BFW1.

TASK 3.1.1: Conduct wet season surveys at BFW1 to document habitat conditions and potential presence of vernal pool invertebrate species described in the previous section (IIIC):

- Vernal pool fairy shrimp
- Vernal pool tadpole shrimp

TASK 3.1.2: Conduct presence/absence surveys for special status plant species that may occur in seasonal wetlands (IVC3.1.2).

TASK 3.1.3: Ensure that actions comply with federal and state endangered species acts and other regulations aimed at the protection of vernal pools and any special-status species associated with seasonal wetlands.

TASK 3.1.4: Monitor special-status species populations to periodically assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species (IVC3.2.1).

TASK 3.1.5: Reassess and adapt management practices, such as livestock grazing, limited herbicide application and native grass plantings, to protect and improve essential habitat for special-status species associated with seasonal wetlands.

GOAL 3.2: Protect and manage vernal pools and other seasonal wetlands for species abundance and richness.

TASK 3.2.1: Conduct baseline plant inventories timed to phenology of specific plant species.

TASK 3.2.2: Inventory amphibians and reptiles in seasonal wetlands to establish baseline data. Conduct surveys in early spring and summer to document chorusing frogs, egg-masses, tadpoles and juveniles.

GOAL 3.3: Maintain and improve connectivity between vernal pools and other seasonal wetlands.

TASK 3.3.1: Assess connectivity within and between vernal pool habitats in the general vicinity of the Wildlife Area to improve vernal pool ecosystems at a larger landscape level.

HABITAT INTEGRITY GOALS

GOAL 3.4: Prevent further loss of biological integrity of seasonal wetlands within the Wildlife Area.

TASK 3.4.1: Limit removal of invasive, undesirable non-native species to hand pulling until presence/absence surveys for special-status species is completed.

TASK 3.4.2: Monitor the effectiveness of grazing as a vegetation management tool on vernal pool/swale and seasonal pond areas (Appendix E) and adapt as needed.

TASK 3.4.3: Collaborate with neighboring landowners in implementing habitat management practices that will strengthen the integrity of vernal pool and seasonal wetland habitats in and near the Wildlife Area.

GOAL 3.5: Maintain and manage vernal pool/swales and seasonal ponds as critical habitat in the Wildlife Area.

TASK 3.5.1: Coordinate management planning of seasonal wetlands on BFW1with the USFWS and its Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (Appendix H).

GOAL 3.6: Protect, manage, and restore vernal pool habitat to promote structural diversity and abundance of native species.

TASK 3.6.1: Set up permanent plots for annual vegetation monitoring of seasonal wetlands (IVC3.1.5).

TASK 3.6.2: Set up permanent monitoring stations for annual photo monitoring of habitat conditions within seasonal wetlands (IVC3.1.6).

TASK 3.6.3: Complete more detailed mapping of vernal pool/swale habitat where needed.

TASK 3.6.4: Assess restoration projects in coordination with the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon and other regional planning efforts (IVC3.3.1; Appendix H).

GOAL 3.7: Protect, restore (or mimic) natural environmental functions within vernal pool ecosystem.

TASK 3.7.1: Research the historic conditions of vernal pools and seasonal pond habitats on BFW1.

TASK 3.7.2: Assess capacity to restore or mimic lost environmental functions historically provided by seasonal wetlands.

ENVIRONMENTAL HEALTH GOALS

GOAL 3.8: Improve environmental health of the vernal pool ecosystem.

TASK: 3.8.1 Implement strategies recommended in the Recovery Plan for Vernal Pool Ecosystems for improving environmental health of seasonal wetlands on BFW1 (IVC3).

TASK 3.8.2: Assist neighboring landowners as needed with reducing off-site sources of pollutants in vernal pools and seasonal ponds within the Wildlife Area.

4. Annual Grassland Habitat Element

PHOTO: Annual grassland spreads across the eastern edge of BFW1. July 2005, SEI

Grasslands are one of the most human-altered terrestrial ecosystems in California. Native perennial grassland types make up less than 1% of state grassland with the balance being dominated by non-native annual grasses. The shift from perennial to annual grasses as the dominant component of the grassland community has modified grassland community structure from a comparatively open and structurally diverse community to one characterized by dense vegetation with fairly homogenous structure. Regardless, grassland provides important habitat for many special-status wildlife and game species. In addition, sensitive elements such as vernal pools are often interspersed in grasslands (CalPIF 2000).

The MCCWA, particularly the Cottonwood Creek Unit, has areas where annual grassland habitats transition to valley oak savannah, with scattered medium to large valley oaks, as well as grassland-riparian transition zones. Oak woodlands and savannahs are another habitat at risk in California, with problems related to low regeneration, habitat fragmentation, disease, and conversion to agricultural and urban use. Non-native annual grasses tend to out-compete native perennials and young oak seedlings for soil moisture, and grazing can damage oak sapling development.

Grasslands and upland habitats are important features within the MCCWA, with the Balls Ferry wetland units having a higher percentage of this habitat than the Cottonwood Creek Unit. Within the MCCWA, there are approximately 417 acres of grassland and pasture of varying grass heights.

Short grass pastures are utilized seasonally by waterfowl, wading birds, shorebirds, and raptors. Tall and medium grass is used by a wide variety of raptors and passerine species. A diverse abundance of species including several special-status species are currently known or have the potential to be using grassland and upland ecosystems at the MCCWA. Comprehensive surveys for these species have not been conducted. If their distribution at MCCWA is more extensive than current documentation indicates, land managers may need to adjust the scope of tasks for this element.

BIOLOGICAL DIVERSITY GOALS

GOAL 4.1: Protect essential habitat for special-status species that occur in annual grassland habitats within or adjacent to the Wildlife Area.

TASK 4.1.1: Identify, map and protect essential habitat for the following special-status species *known or highly likely to occur* in annual grassland habitats within and adjacent to the Wildlife Area (IIIC)::

- White-tailed kite
- Northern harrier
- Loggerhead shrike
- Tricolored blackbird

TASK 4.1.2: Conduct presence/absence surveys for special-status species that have the potential to occur but are not known to occur in annual grassland habitats within and adjacent to the Wildlife Area (IVC4.1.3).

TASK 4.1.3: Ensure that actions comply with the federal and state endangered species acts and other regulations aimed at the protection of special-status species.

TASK 4.1.4: Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species (IVC4.2.1).

TASK 4.1.5: Reassess and adapt as necessary management practices such as livestock grazing, limited herbicide application, and native grass planting intended to protect and improve essential habitat for special-status species.

GOAL 4.2: Protect and manage annual grassland habitat for species abundance and richness.

TASK 4.2.1: Conduct baseline inventory of vertebrate species diversity for grassland habitats, including reptiles, amphibians, birds and mammals (IVC4.1.5)

TASK 4.2.2: Conduct breeding bird survey of annual grassland habitats to establish baseline for species diversity (IVC4.1.3).

TASK 4.2.3: Monitor the distribution and relative abundance of breeding grassland birds on an annual basis as an indicator of diversity within grassland habitats on and adjacent to the Wildlife Area (IVC4.2.1).

TASK 4.2.4: Avoid mechanical vegetation manipulation (mowing, disking, burning) during breeding season (generally until July 1, but timing can vary depending on the site).

GOAL 4.3: Maintain and improve connectivity in annual grassland habitats.

TASK 4.3.1: Assess connectivity between annual grassland habitats in and adjacent to the Wildlife Area.

TASK 4.3.2: Explore easements, acquisitions and MOU with neighboring landowners to manage and restore annual grassland habitats.

HABITAT INTEGRITY GOALS

GOAL 4.4: Prevent further loss of biological integrity within annual grassland habitats in the Wildlife Area.

TASK 4.4.1: Limit removal of invasive, undesirable non-native species to manual, low intensity methods until presence/absence surveys for special-status species are completed.

TASK 4.4.2: Inventory and map distributions of invasive non-native plant populations and integrate data into the GIS database (IVC4.1.6).

TASK 4.4.3: Implement the MCCWA Weed Management Plan (Appendix D) for grassland communities after conducting presence/absence surveys for special-status species and mapping invasive non-native plant populations.

TASK 4.4.4: Monitor the effectiveness of grazing as a vegetation management tool on grasslands (Appendix E) and adapt as needed.

TASK 4.4.5: Collaborate with neighboring landowners in implementing habitat management practices that will strengthen the integrity of annual grasslands in and adjacent to the Wildlife Area.

GOAL 4.5: Maintain and manage critical habitat within annual grassland habitats in the Wildlife Area.

TASK 4.5.1: Coordinate management planning of critical habitat for any listed species potentially occurring within annual grassland habitats of the Wildlife Area with USFWS.

GOAL 4.6: Protect, manage, and restore annual grassland habitat to promote structural diversity and abundance of native species.

TASK 4.6.1: Set up permanent plots for annual vegetation monitoring (IVC4.1.1).

TASK 4.6.2: Set up permanent monitoring stations for annual photo monitoring of habitat conditions (IVC4.1.2).

TASK 4.6.3: Complete more detailed mapping of upland and grassland habitat where needed.

TASK 4.6.4: Identify and promote feasible grassland and upland restoration projects.

TASK 4.6.5: Develop a grasslands habitat restoration plan for MCCWA in conjunction with other regional planning efforts (IVC4.3.1; Appendix H).

GOAL 4.7: Maintain and enhance natural environmental functions and processes of grassland habitats.

TASK 4.7.1: Review historic information on prehistoric herbivory and fire occurrence within the upland and grassland habitats of the Wildlife Area, and assess what naturally occurring functions have been lost.

TASK 4.7.2: Conduct a feasibility study for implementing an integrated range management plan that will restore natural functions (Appendix E).

TASK 4.7.3: Evaluate the benefit of prescribed burning as a means of site restoration.

ENVIRONMENTAL HEALTH GOALS

GOAL 4.8: Improve environmental health of grassland ecosystems.

TASK 4.8.1: Coordinate with Western Shasta Resource Conservation District to assess upland soil structure.

TASK 4.8.2: Assist neighboring landowners as needed with reducing off-site sources of pollutants in annual grassland habitats within the Wildlife Area.

TASK 4.8.3: Annually monitor focal species as an indicator of annual grassland environmental health (IVC4.2.2).

5. Oak Woodland Habitat Element

PHOTO: Oak woodland savannah on northern edge of BFW1. July 2005. SEI

Oak woodlands are among the most aesthetically beautiful and biologically diverse habitats in California, providing nesting habitat, forage, and shelter for a wide variety of wildlife species, as well as substantial human economic value. Over 330 species of birds, mammals, amphibians, and reptiles depend upon them during some stage of their life cycle (CalPIF 2002). Oaks contribute to overall ecosystem health by improving air quality, carbon sequestration, nutrient cycling, soil infiltration rates, maintaining water quality, and reducing sedimentation and erosion (Dalhgren and Singer 1991). As with other high value habitats, oak woodlands and savannahs are at risk in California due to problems related to low regeneration, habitat fragmentation, disease, and conversion to agricultural and urban use. Only about one-third of the 10 to 12 million acres of oak woodlands that once covered California's valleys and hills remain (Tehama RCD 2005).

For planning purposes, this element includes valley oak savanna and the transitional grassland-riparian habitat. Valley oak savanna represents a small but important portion of the MCCWA (50 acres, or approximately 5%), and is distributed mostly on the Cottonwood Creek Unit. The transitional grassland-riparian habitat type includes scattered valley oaks, along with other more typical riparian associates and also comprises about 5% of the total area (46 acres).

BIOLOGICAL DIVERSITY GOALS

GOAL 5.1: Protect essential habitat for special-status species that occur in oak woodlands within or adjacent to the Wildlife Area.

TASK 5.1.1: Identify, map and protect essential habitat for the following special-status species *known or highly likely to occur* in valley oak riparian and woodland habitats within and adjacent to the Wildlife Area (IIIC):

- White-tailed kite
- Bald eagle
- Purple martin
- Pallid bat
- Ringtail

TASK 5.1.2: Conduct presence/absence surveys for special-status species that have the potential to occur but are not known to occur in valley oak riparian and woodland habitats within and adjacent to the Wildlife Area (IVC5.1.3).

TASK 5.1.3: Ensure that actions comply with the federal and state endangered species acts and other regulations aimed at the protection of special-status species.

TASK 5.1.4: Monitor populations of special-status species periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities and human use (IVC5.2.1).

TASK 5.1.5: Reassess and adapt management practices as needed to protect and improve essential habitat for special-status species.

GOAL 5.2: Protect and manage oak woodlands for species abundance and richness.

TASK 5.2.1: Conduct general wildlife surveys in oak woodland habitats to develop an inventory of species known to occur on site (IVC5.1)

TASK 5.2.2: Conduct annual breeding bird surveys to monitor the distribution and relative abundance of breeding birds as an indicator of diversity within oak woodlands in and adjacent to the Wildlife Area (IVC5.2.2).

GOAL 5.3: Maintain and improve connectivity of oak woodlands.

TASK 5.3.1: Assess connectivity within and between oak woodlands in, adjacent to, and near the Wildlife Area.

TASK 5.3.2: Explore easements, acquisitions and MOU with neighboring landowners to manage and restore oak woodland habitats.

HABITAT INTEGRITY GOALS

GOAL 5.4: Prevent further loss of biological integrity of oak woodlands within the Wildlife Area.

TASK 5.4.1: Limit removal of invasive, undesirable non-native species to manual, low intensity methods until presence/absence surveys for special-status species are completed.

TASK 5.4.2: Inventory and map distributions of invasive non-native plant populations and integrate data into the GIS database (IVC5.1.7).

TASK 5.4.3: Implement the MCCWA Weed Management Plan (Appendix D) after conducting presence/absence surveys for special-status species and mapping invasive non-native plant populations.

TASK 5.4.4: Monitor the effectiveness of grazing as a vegetation management tool around valley oaks (Appendix E) and adapt as needed.

TASK 5.4.5: Develop an integrated hardwood management plan for preserving oak woodland habitats in the Wildlife Area.

GOAL 5.5: Maintain and manage critical habitat within oak woodlands in the Wildlife Area.

TASK 5.5.1: Coordinate management planning of critical habitat for any listed species potentially occurring within valley oak riparian forests and valley oak savannas in the Wildlife Area with USFWS.

GOAL 5.6: Protect, manage, and promote structural diversity of valley oak riparian forests and valley oak savannas in the Wildlife Area.

TASK 5.6.1: Set up permanent plots for annual vegetation monitoring within valley oak riparian forest habitats and valley oak savannas (IVC5.1.1).

TASK 5.6.2: Set up permanent monitoring stations for annual photo monitoring of habitat conditions within valley oak habitats (IVC5.1.2).

TASK 5.6.3: Survey and map unique habitat features such as downed wood and snags within valley oak woodlands, and incorporate these features into the GIS database (IVC5.1.6).

TASK 5.6.4: Identify priority valley oak restoration and regeneration sites within the Wildlife Area.

TASK 5.6.5: Improve habitat in the oak woodland ecosystems throughout the Wildlife Area through the adaptive management of livestock grazing, limited herbicide application, native grass plantings, and other management techniques.

TASK 5.6.6: Develop a valley oak preservation and regeneration plan in coordination with regional planning efforts (IVC5.3.1; Appendix H).

GOAL 5.7: Maintain and enhance natural environmental functions and processes within valley oak habitats.

TASK 5.7.1: Research information on the natural occurrence of herbivory, fires and wetlands in the Wildlife Area, and assess how these environmental functions contributed to the integrity of valley oak habitats.

TASK 5.7.2: Assess the value of using livestock grazing as a tool to mimic prehistoric herbivory in oak woodland habitats (Appendix E).

TASK 5.7.3: Assess the value of removing Himalayan blackberries from valley oak riparian areas.

TASK 5.7.4: Evaluate the use of prescribed burns to assist in maintaining valley oak habitats.

TASK 5.7.5: Identify areas where nesting boxes may contribute to species abundance and diversity in oak woodlands.

ENVIRONMENTAL HEALTH GOALS

GOAL 5.8: Improve environmental health of oak woodland ecosystems.

TASK 5.8.1: Conduct baseline inventory of focal bird species utilizing different attributes of oak woodland habitats (IVC5.2.2).

TASK 5.8.2: Coordinate with Western Shasta Resource Conservation District to conduct soil surveys in valley oak habitats.

TASK 5.8.3: Avoid large-scale changes to water management practices without assessing long-term effects to oak woodlands.

TASK 5.8.4: Assist neighboring landowners as needed with reducing off-site sources of pollutants that threaten oak woodland habitats within the Wildlife Area.

TASK 5.8.5: Annually monitor focal species as an indicator of the environmental health of oak woodland habitats in the Wildlife Area (IVC5.2.2).

C. Biological Monitoring Elements

Biological monitoring is a necessary component of the California Department of Fish and Game's mission "to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend" as well as a critical component of implementing an adaptive management program for ecological systems. To date, however, very little data have been collected on baseline conditions at the Mouth of Cottonwood Creek Wildlife Area. The phased approach presented here will enable the department to begin data collection, analysis and assessments in coordination with regional habitat conservation planning efforts. It is also intended to add to the body of knowledge about species, habitats and natural communities in the region as well as provide feedback on the effectiveness of land management practices.

Biological monitoring elements are focused on the same priority habitat elements for which biological goals were developed in the previous section (IVB):

1. Riverine and Riparian Habitat Monitoring Element
2. Freshwater Wetland Habitat Monitoring Element
3. Vernal Pool and Seasonal Pond Habitat Monitoring Element
4. Annual Grassland Habitat Monitoring Element
5. Oak Woodland Habitat Monitoring Element

Special-status species, including federal and state listed species, species of special concern and species listed by the California Native Plant Society (CNPS), are addressed within the habitat element in which they are found or potentially could occur at the Mouth of Cottonwood Creek Wildlife Area (MCCWA).

Establishing an Adaptive Management Approach

Land managers are frequently confronted with the quandary of how to manage resources with limited funding and partial information. One approach to this challenge is to simply begin, then adapt practices as knowledge increases. This approach starts by basing the management plan on the broadest ecological level (habitat), then working towards a comprehensive ecological inventory of the site, integrating data as it becomes available, measuring data against indicators of success, and modifying management strategies as new information is learned. This is the backbone of a comprehensive and adaptive land management plan.

Measuring ecosystem condition and responses of the ecosystem to both intentional (e.g., management actions) and natural changes (e.g., flooding) is a critical piece of the adaptive management feedback loop. Over time, monitoring indicates trends in species and habitats (e.g., increasing, decreasing, static) that may be correlated to specific conservation and management activities.

While some management activities are straight forward (trash removal, sign posting), other management activities produce much greater uncertainty (habitat restoration). Due to the complex variables and uncertainty involved in managing and monitoring ecosystems and special-status species, the development of a biological monitoring and implementation program typically proceeds in the three phases (Atkinson et al. 2004).

Phase 1: Baseline Data Collection

Inventorying resources and identifying relationships.

The main goal of Phase 1 is to determine the baseline condition of the system as a prelude to long-term monitoring program design. This generally involves an inventory of what species, habitats, and other resources are present, their locations and general conditions. Some management can be applied during this phase but generally this should be limited to actions of known impact, such as hand-removal of weeds, or maintaining existing habitat management practices, such as water distribution or grazing, until such practices can be appropriately evaluated.

Phase 2: Long-Term Monitoring Set Up

Pilot testing of long-term monitoring protocols and resolving critical management uncertainties.

Phase 2 is characterized by testing long-term monitoring protocols and sampling models to select cost-effective designs with sufficient statistical power to detect biologically relevant and management-relevant changes. The pilot phase often progresses through an iterative process, including revisions to protocols and comparisons of multiple methods. In addition, the pilot phase is an opportunity to conduct targeted studies to resolve critical management uncertainties and refine conceptual models based on emerging information.

Phase 3: Reassessment and Adjustments

Implementing long-term monitoring and adaptive management.

Phase 3 activities include implementation of long-term monitoring protocols and periodic evaluation and refinement of the monitoring program. The program continues to address uncertainties, principally by evaluating responses to management and extreme events. Emerging uncertainties are also addressed and prioritized, such as a new invasive species or pollution source. *Due to the general lack of baseline data on the MCCWA, this document is not able to address Phase 3 since it will depend largely on the findings of Phases 1 and 2.*

Adaptive Management at the MCCWA

Critical Needs

Conducting Focused Surveys for Special-Status Species. A primary concern of the CDFG is the protection of special-status species and their habitats. Since little is known about the presence of special-status species at the MCCWA, this management plan makes conducting focused surveys for both plants and wildlife species a top priority. Monitoring the presence of special-status species within and adjacent to the Wildlife Area will contribute the scientific understanding of regional population trends for these species and will be provide valuable information about the overall health of ecosystems at a larger landscape level.

Populations of two special-status plants, silky cryptantha and fox sedge, were documented during reconnaissance-level and focused surveys. Some of the special-status wildlife observed at the MCCWA include Northern Pacific pond turtle, American white pelican, bald eagle, northern

harrier, white-tailed kite, peregrine falcon, yellow-breasted chat, and yellow warbler. Comprehensive surveys assessing the distribution of these species at the Wildlife Area will determine the need for and scope of the other tasks in this section.

Regionally, substantial losses of historic habitat used by neotropical migratory song birds suggest that population levels for many of these species are declining. Continued management of existing habitat, along with restoration of additional suitable wetland, riparian and grassland habitats in the Wildlife Area, is important to maintaining healthy neotropical migrant bird populations. Increasing the structural diversity of riparian vegetation at the MCCWA will benefit these species by improving nesting habitat and reducing nest parasitism and predation.

Monitoring Focal Species. Focal species are those whose habitat requirements define different spatial attributes, habitat characteristics and management regimes characteristic of healthy ecosystems. For example, both the Western scrub-jay and, to a lesser degree, the yellow-billed magpie cache acorns individually in the ground. Because many of these acorns remain unretrieved and germinate, they are the only species among caching birds to facilitate oak regeneration (CalPIF 2002).

PHOTO: Western scrub jay in flight with throat and beak engorged with acorns.

Since birds occupy a wide variety of ecological niches and are relatively easy to monitor in comparison to other taxa, they are often used as focal species for monitoring. Many of the focal bird species identified by California Partners in Flight (CalPIF) have been observed at the MCCWA. Focal species for each habitat type are provided in this element. Monitoring their annual status is key to understanding trends in the health of ecosystems within the Wildlife Area and the region.

Collecting Useful Scientific Data. Data management begins with proper collection and recordkeeping in the field. Inventories and sampling protocols must be established so that different people can gather comparable datasets over time. Protocols should not be overly reliant on technology that is likely to change or become obsolete so that datasets are no longer replicable. Data must also be reported consistently to serve an adaptive management purpose.

CDFG's Species and Natural Communities Monitoring and Assessment Program is working to develop and implement a long-term and strategic program to inventory, monitor, and assess the distribution and abundance of priority species, habitats, and natural communities in California. This strategic program will bring many of the varied data collection, compilation, and dissemination efforts under the "umbrella" of a systematic and more comprehensive effort. The intent of the program is to more effectively address resource assessment priorities and refocus existing efforts in the collection, analysis, and use of data on native fish, wildlife, plants, and communities. A list of data, mapping and assessment resources, both internal and external to CDFG, appears in Appendix G.

Providing Quality Control. CDFG should guide the setup and implementation of the biological monitoring program, including development of the quality assurance program and specific protocols for data sampling. MCCWA personnel should also coordinate with larger regional resource planning serves to improve the long-term viability of habitats and species while providing access to additional data and technical expertise.

1. Riverine and Riparian Habitat Monitoring Element

Adaptive Management Plan

Riparian corridors are generally more productive and have higher plant species richness than surrounding upland ecosystems. However, because of naturally high rates of hydrological disturbance and high edge-to-area ratios at both the landscape and localized patch scales, riparian habitat systems are susceptible to invasion by non-native plants, which may constitute 25% to 30% of species (Malanson 1993, Planty-Tabacchi et al. 1996). Parameters for monitoring patterns in riparian vegetation include woody and herbaceous plant cover, species richness or composition (including relative importance of non-native and upland species), size/age structure of dominant riparian trees, and total vegetation volume.

PHASE 1: BASELINE DATA COLLECTION

GOAL 1.1: Complete a resources inventory of riverine and riparian habitats and identify relationships between biological elements.

TASK 1.1.1: *Set up permanent plots for annual vegetation monitoring.* Permanent vegetation monitoring plots provide consistent reference points from which to measure and monitor changes in species distribution, plant density, and canopy cover within a given habitat (Elzinga et al. 2001). These data are especially valuable when undertaking habitat restoration. Permanent vegetation monitoring plots should be established in each of the habitat types at the MCCWA.

TASK 1.1.2: *Set up permanent photo monitoring stations for annual documentation of habitat conditions.* Photographs are by far the easiest monitoring tool available to a manager. They are an inexpensive visual record of the site over time. Establishing permanent photo points in each of the habitats at the MCCWA will provide another method of documenting changes and compliment other monitoring programs.

TASK 1.1.3: *Conduct presence/absence surveys for special-status species (flora and fauna) using accepted federal and state protocols, and submit occurrence data to CNDDB.* Special-status species that have the potential to occur but are not known to occur in riverine and riparian habitats within and adjacent to the Wildlife Area (IIIC):

- Silky cryptantha
- Western yellow-billed cuckoo
- Willow flycatcher
- Purple martin
- Bank swallow
- California yellow warbler
- Yellow-breasted chat
- Pallid bat

Focused surveys for silky cryptantha needed to be conducted along the Cottonwood Creek floodplain. This special-status plant species was noted during 1994 surveys but not during the 2006 botanical resource surveys. It is likely the plant was not rediscovered because the Cottonwood Creek channel has shifted several times during the intervening years. Additional surveys should be conducted to assess the status of this plant at the MCCWA. The extent and location of all special-status plant populations should be documented using GPS and added to the GIS database for the MCCWA.

TASK 1.1.4: *Conduct bat surveys (using Anabat software or similar tool) to determine species utilization of the MCCWA.* The particular combination of habitats at the MCCWA (riparian, freshwater emergent wetland, grasslands, and oak savanna) may support the pallid bat as well as other bat species.

TASK 1.1.5: *Conduct a detailed, plot-based classification of the riparian forests* on the site to identify distinct subtypes based on canopy composition and microhabitat factors using Rapid Assessment Protocol (CNPS 2006).

TASK 1.1.6: *Conduct breeding bird surveys of riverine and riparian habitats.* Use either area searches or point counts to determine species composition and presence/absence of special-status species (Ralph et al. 1993). Birds are sensitive indicators of environmental conditions because of their high metabolic rate, their relatively high position in the food chain and their distribution across a wide variety of habitats (RHJV 2004). A large number of bird species breed in riparian habitat in California; many others use riparian areas during some portion of their life cycle. By managing for a diversity of birds species, CDFG will also protect many other elements of biodiversity and the natural processes that are integral to the riparian ecosystem (e.g., bank swallows depend upon regular high-water events to create exposed riverbank sites that they use for nesting).

TASK 1.1.7: *Inventory and map distributions of invasive non-native plant populations* and integrate data into the GIS database for MCCWA. Mapping invasive plant populations is the first step in prioritizing management activities directed towards controlling their spread (Appendix D).

TASK 1.1.8: *Conduct baseline BMI sampling along Cottonwood Creek* using CDFG's protocol for BMI surveys in low gradient streams (CDFG 2003b). Using aquatic macro invertebrates to monitor water quality is by far the most popular method used throughout the world. Aquatic macro invertebrates are ubiquitous, relatively stationary and their large species diversity provides a spectrum of responses to environmental stresses. BMI monitoring programs have been developed throughout the United States using citizen volunteers and students (USEPA 2000).

PHASE 2: LONG-TERM MONITORING SET UP

GOAL 1.2: Test long-term monitoring strategies and resolve critical management uncertainties.

TASK 1.2.1: *Establish cooperative agreements with local and regional conservation groups and resource agencies to enhance special-status species habitats and monitor regional special-status species populations.* Monitoring populations of special-status species should be conducted periodically to assess overall habitat integrity, detect changes in distribution and abundance, and

detect positive and adverse effects of management activities, human use, and/or nonnative species.

TASK 1.2.2: *Monitor the distribution and relative abundance of breeding riparian birds on an annual basis* using area searches or point counts of locally occurring focal species identified in the Riparian Bird Conservation Plan (RHVJ 2004) (Figure a).

TASK 1.2.3: *Implement a grazing management and monitoring plan for the MCCWA*, with special emphasis upon assessing grazing effects on riparian habitat. Due to the presence of water and shade, riparian ecosystems are subject to more intense grazing pressure than adjacent uplands. The Sustainable Rangelands Roundtable (2006) has identified 27 core indicators for rangeland monitoring including percentage of bare ground, erosion, changes in the biotic assemblage in wetland habitats (including BMIs), water quality, and plant and animal community composition. Many of these indicators overlap with other biological monitoring tasks identified in this plan (IVF3; Appendix E).

TASK 1.2.4: *Annually monitor species diversity and abundance of BMIs along Cottonwood Creek*, coordinating efforts if possible with the activities of the Balls Ferry Research and Education Center (IVE) or local watershed groups (Appendices G and H).

TASK 1.2.5: *Establish long-term monitoring protocols for riverine and riparian habitats* after evaluating monitoring strategies and environmental responses to management practices. Phase 3 of adaptive management planning should address any changing conditions and include periodic evaluation and refinement of the monitoring program.

COORDINATION WITH REGIONAL CONSERVATION PLANNING

GOAL 1.3: Improve the connectivity, integrity and health of riverine and riparian habitats at the MCCWA and at the larger landscape level.

TASK 1.3.1: Obtain, as necessary, and review regional conservation plans (Appendix H) pertaining to riverine and riparian habitats at the MCCWA, including:

- *CALFED Ecosystem Restoration Program* (CALFED Bay-Delta Authority)
- *California Riparian Habitat Conservation Program* (Wildlife Conservation Board)
- *Cottonwood Creek Watershed Management Plan* (Cottonwood Creek Watershed Group)
- *Neotropical Migratory Bird Conservation Act* (USFWS)
- *Riparian Bird Conservation Plan* (Riparian Habitat Joint Venture)
- *Sacramento River Conservation Area, Management Guidelines* (Sacramento River Advisory Council)
- *Shasta County General Plan, Stream Corridor Protection Plan* (Shasta County)

Collaboration with the agencies and groups responsible for implementing these plans (IVH; Appendix H) will help optimize the value of CDFG land acquisitions, management of critical habitat, and restoration activities.

Figure a. Riverine and Riparian Focal Species

Warbling vireo © Ted Ardley

Tree swallow © Lars Erik Johannesse

Yellow warbler © 2007 Ron Wolf

Common yellowthroat © 2008 Ron Wolf

Yellow-breasted chat © fugle

Song sparrow © 2005 Stephen Dowlan

2. Freshwater Wetland Habitat Monitoring Element

Adaptive Management Plan

All freshwater wetland habitat types that occur at the MCCWA have been grouped for this discussion since they share similar attributes and challenges. Wetland habitat management requires juggling a challenging set of variables, including water quantity, quality, plant succession, and wildlife use. Aside from the Cottonwood Creek Wetland Mitigation Bank, little is presently known about the status or condition of the wetland habitats at the MCCWA. It is important to quantify the existing conditions in order to determine appropriate long-term management strategies and actions, and to evaluate the outcome of those activities.

PHASE 1: BASELINE DATA COLLECTION

GOAL 2.1: Complete a resources inventory of freshwater wetland habitats and identify relationships between biological elements.

TASK 2.1 .1: *Set up permanent plots for annual vegetation monitoring.* Permanent vegetation monitoring plots provide consistent reference points from which to measure and monitor changes in species distribution, plant density, and canopy cover within a given habitat (Elzinga et al. 2001). These data are especially valuable when undertaking habitat restoration. Permanent vegetation monitoring plots should be established in each of the habitat types at the MCCWA.

TASK 2.1.2: *Set up permanent photo monitoring stations for annual documentation of habitat conditions.* Photographs are by far the easiest monitoring tool available to a manager. They are an inexpensive, visual record of the site over time. Establishing permanent photo points in each of the habitats at the MCCWA will provide another method of documenting changes and compliment other monitoring programs.

TASK 2.1.3: *Conduct presence/absence surveys for special-status species using accepted federal and state protocols and submit occurrence data to CNDDB.* Special-status species that have the potential to occur but are not known to occur in freshwater wetland habitat within and adjacent to the Wildlife Area (IIIC):

- Henderson's bent grass
- Pointed broom sedge
- Boggs Lake hedge-hyssop
- Red Bluff dwarf rush
- Sanford's arrowhead
- Northern Pacific pond turtle
- Redhead
- Least bittern
- Tricolored blackbird
- Yellow-headed blackbird
- Pallid bat

TASK 2.1.4: *Conduct bat surveys (using Anabat software or similar tool) to determine species utilization of the MCCWA.* The particular combination of habitats at the MCCWA (riparian, freshwater emergent wetland, grasslands, and oak savanna) may support pallid bat as well as other bat species.

TASK 2.1.5: *Conduct monthly surveys of wetland dependant birds for at least one full year* to establish baseline for species diversity.

TASK 2.1.6: *Inventory amphibian and reptiles in wetland habitats.* Surveys should be conducted in early spring and summer to document chorusing frogs, egg-masses, tadpoles and juveniles. A survey for Western pond turtles and their potential nesting sites also needs to be conducted. All occurrences of special-status species should be documented and mapped.

TASK 2.1.7: *Inventory and map distributions of invasive non-native plant populations and integrate data into the GIS database.*

TASK 2.1.8: *Conduct BMI surveys in all freshwater emergent wetlands using approved CDFG and Environmental Protection Agency (EPA) protocols.* Wetland invertebrates occur in the entire spectrum of available aquatic wetland habitats and conditions. They are found in the sediment, in the water column, on and amongst the submerged and emergent vegetation. They are found in abundance in large and small, and permanent and seasonal wetlands. Wetland macro invertebrates have a greater tolerance of low dissolved oxygen concentrations than stream macro invertebrates, but they are still sensitive to a variety of physical and chemical factors. Invertebrate community data and Index of Biological Integrity (IBI) can be used for various wetland management needs and decisions, including:

- Condition monitoring (status and trends)
- Problem investigation monitoring
- Wetland mitigation effectiveness monitoring
- Total maximum daily load (TMDL) investigations, including listing, delisting, and effectiveness of implementation.

TASK 2.1.9: *Sample and analyze water quality in wetlands at both the Balls Ferry Units and Cottonwood Creek Unit* (dissolved oxygen, temperature, PH, turbidity, total and fecal coliforms, *E. coli).* The general topography of this area of Shasta County slopes south and east toward the Sacramento River; therefore, water used at the MCCWA eventually drains toward the Sacramento River. With the added influence of irrigated pasture and grazing, it is important to monitor water quality as it moves through the wetlands to understand and quantify potential water quality issues related to management of these properties.

PHASE 2: LONG-TERM MONITORING SET UP

GOAL 2.2: Test long-term monitoring strategies and resolve critical management uncertainties.

TASK 2.2.1: *Establish cooperative agreements with local and regional conservation groups and resource agencies to enhance special-status species habitats and monitor regional special-status species populations.* Monitoring populations of special-status species should be conducted periodically to assess overall habitat integrity, detect changes in distribution and abundance, and

detect positive and adverse effects of management activities, human use, and/or nonnative species.

TASK 2.2.2: *Monitor the distribution and relative abundance of wetland-dependent birds on an annual basis* using area searches or point counts of locally occurring focal species identified in the Riparian Bird Conservation Plan (RHJV 2004) (Figure b).

TASK 2.2.3: *Implement a grazing management and monitoring plan for the MCCWA.* Land managers should continue to work cooperatively with the Western Shasta Resource Conservation District and grazing lessees to implement a grazing management and monitoring plan for both the Balls Ferry Wetland Units with special emphasis upon assessing grazing effects on grassland and wetland habitats and water quality (IVF3; Appendix E). The University of California Cooperative Extension (UCCE) Services may be available to help oversee this task.

TASK 2.2.4: *Annually monitor species diversity and abundance of BMIs and water quality parameters,* coordinating efforts if possible with the activities of the Balls Ferry Research and Education Center (IVE) or local watershed groups (Appendices G and H).

TASK 2.2.5: *Establish long-term monitoring protocols for freshwater wetland habitats* after evaluating monitoring strategies and environmental responses to management practices. Phase 3 of adaptive management planning should address any changing conditions and include periodic evaluation and refinement of the monitoring program.

COORDINATION WITH REGIONAL CONSERVATION PLANNING

GOAL 2.3: Improve the connectivity, integrity and health of freshwater wetland habitats at the MCCWA and at the larger landscape level.

TASK 2.3.1: Obtain, as necessary, and review regional conservation plans (Appendix H) pertaining to freshwater wetland habitats at the MCCWA, including:

- *California Wetlands Conservation Policy* (California EPA)
- *Central Valley Project Conservation Program Habitat Restoration Program* (U.S. Bureau of Reclamation, USFWS and CDFG)
- *Cottonwood Creek Mitigation Bank* (CDFG)
- *Inland Wetlands Conservation Program* (WCB)
- *North American Waterfowl Management Plan* (Central Valley Joint Venture)

Collaboration with the agencies and groups responsible for implementing these plans (IVH; Appendix H) will help optimize the value of CDFG land acquisitions, management of critical habitat, and restoration activities.

Figure b. Freshwater Wetland Focal Species

Common yellowthroat © 2008 Ron Wolf

Yellow-breasted chat © fugle

Song sparrow © 2005 Stephen Dowlan

3. Vernal Pool and Seasonal Pond Habitat Monitoring Element

Adaptive Management Plan

Two elongated low-lying areas north of the large pond on BFW1 are inundated early in the season, and then dry out completely in the spring. These areas, approximately 2 acres in extent, support a distinctive assemblage of mostly native plant species characteristic of vernal pools and similar vernally wet habitats. To date there have been no protocol level surveys for vernal pool invertebrates.

Near the southwest corner of BFW1 there is a small but fairly deep pond that mostly dries out in late season, although the deepest part may contain water permanently. It supports an assemblage of mostly native species including the native aquatic herb diverse-leaved pondweed. There is considerable pale spike-rush around the margins and, at the outer margins, considerable pennyroyal. The dry bed is almost bare but supports native species characteristic of vernally wet habitats, including stalked popcorn-flower, Hoover's downingia, smooth lasthenia, and bractless hedge-hyssop.

PHASE 1: BASELINE DATA COLLECTION

GOAL 3.1: Complete a resources inventory of vernal pool and seasonal pond habitats and identify relationships among biological elements.

TASK 3.1.1: *Set up permanent plots for annual vegetation monitoring.* Permanent vegetation monitoring plots provide consistent reference points from which to measure and monitor changes in species distribution, plant density, and canopy cover within a given habitat (Elzinga et al. 2001). These data are especially valuable when undertaking habitat restoration. Permanent vegetation monitoring plots should be established in each of the habitat types at the MCCWA.

TASK 3.1.2: *Set up permanent photo monitoring stations for annual documentation of habitat conditions.* Photographs are by far the easiest monitoring tool available to a manager. They are an inexpensive, visual record of the site over time. Establishing permanent photo points in each of the habitats at the MCCWA will provide another method of documenting changes and compliment other monitoring programs.

TASK 3.1.3: *Conduct wet season vernal pool invertebrate surveys at BFW1 to document habitat conditions and potential presence of vernal pool invertebrate species.* A qualified biologist will be required to conduct this assessment.

TASK 3.1.4: *Conduct presence/absence surveys for special-status species using accepted federal and state protocols and submit occurrence data to CNDDB.* Special-status species that have the potential to occur but are not known to occur in vernal pool and seasonal pond habitat within and adjacent to the Wildlife Area (IIIC):

- Henderson’s bent grass Boggs lake hedge-hyssop
- Red bluff dwarf rush
- Legenere

- Slender Orcutt grass
- Ahart's paronychia
- Sanford's arrowhead

TASK 3.1.5: *Inventory amphibians and reptiles in vernal pool/swale habitats to establish baseline data.* Conduct surveys in early spring and summer to document chorusing frogs, egg-masses, tadpoles and juveniles.

TASK 3.1.6: *Limit removal of invasive, undesirable non-native species to hand-pulling until presence/absence surveys for special status species are completed.*

PHASE 2: LONG-TERM MONITORING SET UP

GOAL 3.2: Test long-term monitoring strategies and resolve critical management uncertainties.

TASK 3.2.1: *Establish cooperative agreements with local and regional conservation groups and resource agencies to enhance special-status species habitats and monitor regional special-status species populations.* Monitoring populations of special-status species should be conducted periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.

TASK 3.2.2: *Monitor vernal pools and seasonal pond habitat during early spring and summer every year* using standard protocol for vertebrate and invertebrate species.

TASK 3.2.3: *Monitor the implementation of grazing as a vegetation management tool on the vernal pool/swale and seasonal pond areas* of BFW1 (Appendix E) and adapt as needed.

TASK 3.2.4: *Establish long-term monitoring protocols for vernal pools and other seasonal wetlands* after evaluating monitoring strategies and environmental responses to management practices. Phase 3 of adaptive management planning should address any changing conditions and include periodic evaluation and refinement of the monitoring program.

COORDINATION WITH REGIONAL CONSERVATION PLANNING

GOAL 3.3: Improve the connectivity, integrity and health of vernal pools and seasonal wetland habitats at the MCCWA and at the larger landscape level.

TASK 3.3.1: Obtain, as necessary, and review regional conservation plans (Appendix H) pertaining to vernal pools and seasonal wetland habitats at the MCCWA, including:

- *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (USFWS)
- *North American Waterfowl Management Plan* (Central Valley Joint Venture)

Collaboration with the agencies and groups responsible for implementing these plans (IVH; Appendix H) will help optimize the value of CDFG land acquisitions, management of critical habitat, and restoration activities.

4. Annual Grassland Habitat Monitoring Element

Adaptive Management Plan

Annual grasslands represent approximately 41% of the total area of the MCCWA (approximately 417 acres). Grassland habitats at the Wildlife Area are artifacts of previous land use regimes, including cultivated crops and grazing, and have become dominated by nonnative annual grasses and forbs. In the absence of grazing and fire, annual grasslands require active management to maintain their ecological integrity and structural diversity. Grassland habitat management activities may include prescriptive burning, grazing, mechanical treatments, and/or selective herbicide use. Since there has been no focused grassland management at the Cottonwood Creek Unit since CDFG acquired the property, there is an unusual opportunity to establish ecological baseline conditions, develop management scenarios that address long-term biological goals, and monitor the effectiveness of these strategies.

PHASE 1: BASELINE DATA COLLECTION

GOAL 4.1: Complete a resources inventory of annual grassland habitats and identify relationships between biological elements.

TASK 4.1 .1: *Set up permanent plots for annual vegetation monitoring.* Permanent vegetation monitoring plots provide consistent reference points from which to measure and monitor changes in species distribution, plant density, and canopy cover within a given habitat (Elzinga et al. 2001). These data are especially valuable when undertaking habitat restoration. Permanent vegetation monitoring plots should be established in each of the habitat types at the MCCWA.

TASK 4.1.2: *Set up permanent photo monitoring stations for annual documentation of habitat conditions.* Photographs are by far the easiest monitoring tool available to a manager. They are an inexpensive, visual record of the site over time. Establishing permanent photo points in each of the habitats at the MCCWA will provide another method of documenting changes and compliment other monitoring programs.

TASK 4.1.3: *Conduct presence/absence surveys for special-status species using accepted federal and state protocols and submit occurrence data to CNDDB.* Special-status species that have the potential to occur but have not yet been documented in the annual grassland habitats within and adjacent to the Wildlife Area include (IIIC):

- Henderson's bent grass
- Pointed broom sedge
- Ahart's paronychia
- Red-flowered lotus
- Swainson's hawk
- Loggerhead shrike

- Yellow-breasted chat
- Pallid bat

TASK 4.1.4: *Conduct bat surveys (using Anabat software or similar tool) to determine species utilization of the MCCWA.* The particular combination of habitats at the MCCWA (riparian, freshwater emergent wetland, grasslands, and oak savanna) may support pallid bat as well as other bat species.

TASK 4.1.5: *Conduct baseline inventory of vertebrate species of grassland habitats, including reptiles, amphibians, birds and mammals.*

TASK 4.1.6: *Survey and map target noxious non-native grasses and forbs in annual grassland habitats* (Appendix D).

PHASE 2: LONG-TERM MONITORING SET UP

GOAL 4.2: Test long-term monitoring strategies and resolve critical management uncertainties.

TASK 4.2.1: *Establish cooperative agreements with local and regional conservation groups and resource agencies to enhance special-status species habitats and monitor regional special-status species populations.* Monitoring populations of special-status species should be conducted periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.

TASK 4.2.2: *Conduct annual breeding bird surveys* in grassland habitats using standardized protocols, such as point counts (CalPIF 2000) (Figure c)

TASK 4.2.3: *Monitor the response of grassland species to management strategies,* including grazing, prescriptive burning, mechanical treatment or herbicide use.

TASK 4.2.4: *Assess the effectiveness of grazing as a vegetation management tool in annual grassland habitats and adjust as needed* (IVF3; Appendix E).

TASK 4.2.5: *Establish long-term monitoring protocols for annual grassland habitats* after evaluating monitoring strategies and environmental responses to management practices. Phase 3 of adaptive management planning should address any changing conditions and include periodic evaluation and refinement of the monitoring program.

COORDINATION WITH REGIONAL CONSERVATION PLANNING

GOAL 4.3: Improve the connectivity, integrity and health of annual grassland habitats at the MCCWA and at the larger landscape level.

TASK 4.3.1: Obtain, as necessary, and review regional conservation plans (Appendix H) pertaining to annual grassland habitats at the MCCWA, including:

- *Draft Grassland Bird Conservation Plan* (California Partners in Flight)
- *Habitat Enhancement and Restoration Program* (General) (WCB)
- *Shasta Cooperative Weed Management Area* (California Department of Food and Agriculture)

Collaboration with the agencies and groups responsible for implementing these plans (IVH; Appendix H) will help optimize the value of CDFG land acquisitions, management of critical habitat, and restoration activities.

Figure c. Annual Grassland Focal Species

Northern harrier © 2006 Tom Greer

White-tailed kite © 2004 Tom Greer

Western meadowlark © glcc writer

Grasshopper sparrow © [illegible]

Savannah sparrow © Clyde Barrett

5. Oak Woodland Habitat Monitoring Element

Adaptive Management Plan

Oak woodlands are among the most biologically diverse habitats, providing nesting habitat, forage, and shelter for a wide variety of wildlife species. Oak dominated habitats represent a small, but important portion of the MCCWA (approximately 5%). Many of the focal species identified in the Oak Woodland Bird Conservation Plan (CalPIF 2002) have been observed at the MCCWA. Focal bird species are important because they utilize different attributes of this habitat. For example, Western scrub-jay, and, to a lesser degree, the yellow-billed magpie, cache acorns individually in the ground, and thus, among caching birds, are the only species to facilitate oak regeneration because many acorns remain unretrieved and germinate (ibid.). Other plans like the "Western Quail Management Plan" (2009) will be important for restoration and monitoring strategies.

PHASE 1: BASELINE DATA COLLECTION

GOAL 5.1: Complete a resources inventory of oak woodland habitats and identify relationships between biological elements.

TASK 5.1.1: *Set up permanent plots for annual vegetation monitoring.* Permanent vegetation monitoring plots provide consistent reference points from which to measure and monitor changes in species distribution, plant density, and canopy cover within a given habitat (Elzinga et al. 2001). These data are especially valuable when undertaking habitat restoration. Permanent vegetation monitoring plots should be established in each of the habitat types at the MCCWA.

TASK 5.1.2: *Set up permanent photo monitoring stations for annual documentation of habitat conditions.* Photographs are by far the easiest monitoring tool available to a manager. They are an inexpensive, visual record of the site over time. Establishing permanent photo points in each of the habitats at the MCCWA will provide another method of documenting changes and compliment other monitoring programs.

TASK 5.1.3: *Conduct presence/absence surveys for special-status species using accepted federal and state protocols and submit occurrence data to CNDDB.* Special-status species that have the potential to occur but are not known to occur in oak woodland habitats within and adjacent to the Wildlife Area (IIIC):

- Swainson's hawk
- Loggerhead shrike
- Purple martin
- Pallid bat
- Ringtail

TASK 5.1.4: *Conduct bat surveys (using Anabat software or similar tool) to determine species utilization of the MCCWA.* The particular combination of habitats at the MCCWA (riparian, freshwater emergent wetland, grasslands, and oak savanna) may support pallid bat as well as other bat species.

TASK 5.1.5: *Conduct general wildlife surveys in oak woodland habitats to develop baseline inventory of species* known to occur on site.

TASK 5.1.6: *Survey and map unique habitat features* such as downed wood and snags within the oak woodland areas, incorporate these features into the GIS database.

TASK 5.1.7: *Survey and map target noxious non-native invasive species* in oak woodland habitats (Appendix D).

TASK 5.1.8: *Identify possible restoration areas* within the oak woodlands habitat.

PHASE 2: LONG-TERM MONITORING SET UP

GOAL 5.2: Test long-term monitoring strategies and resolve critical management uncertainties.

TASK 5.2.1: *Establish cooperative agreements with local and regional conservation groups and resource agencies to enhance special-status species habitats and monitor regional special-status species populations.* Monitoring populations of special-status species should be conducted periodically to assess overall habitat integrity, detect changes in distribution and abundance, and detect positive and adverse effects of management activities, human use, and/or nonnative species.

TASK 5.2.2: *Using point counts or area searches, conduct annual breeding bird surveys* in oak habitats concentrating on the focal species identified in the Oak Woodland Bird Conservation Plan (CalPIF 2002) (Figure d).

TASK 5.2.3: Implement a grazing management and monitoring plan (IVF3; Appendix E).

TASK 5.2.4: *Establish long-term monitoring protocols for oak woodland habitats* after evaluating monitoring strategies and environmental responses to management practices. Phase 3 of adaptive management planning should address any changing conditions and include periodic evaluation and refinement of the monitoring program.

COORDINATION WITH REGIONAL CONSERVATION PLANNING

GOAL 5.3: Improve the connectivity, integrity and health of oak woodland habitats at the MCCWA and at the larger landscape level.

TASK 5.3.1: Obtain, as necessary, and review regional conservation plans (Appendix H) pertaining to oak woodland habitats at the MCCWA, including:

- *California Oak Woodlands Conservation Program* and *Habitat Enhancement and Restoration Program (General)* (WCB)
- *Integrated Hardwood Range Management Program* (University of California Cooperative Extension)
- *Oak Woodland Bird Conservation Plan* (California Partners in Flight)
- *Oak Woodland Management Guidelines* (Shasta County)
- *Oaks 2040: The Status and Future of Oaks in California* (California Oak Foundation)

Collaboration with the agencies and groups responsible for implementing these plans (IVH; Appendix H) will help optimize the value of CDFG land acquisitions, management of critical habitat, and restoration activities.

Figure d. Oak Woodland Focal Species

Wood duck (*Aix sponsa*)
© Darhawk

Wild turkey (*Meleagris gallopavo*)
© 2007 Kim Cabrera

California quail (*Callipepla californica*)
© 2005 Tom Greer

Red-shouldered hawk (*Buteo lineatus*)
© 2004 George Hartwell

Band-tailed pigeon (*Columba fasciata*) © Joyce Gross 2006

Northern pygmy owl (*Glaucidium gnoma*)
© 2003 Stephen Dowlan

Figure IV-d (continued). Oak Woodland Focus Species

Lewis woodpecker (*Melanerpes lewis*)
© 2007 Ron Wolf

Acorn woodpecker (*Melanerpes formicivorus*) © 2007 Don Getty

Nuttall's woodpecker (*Picoides nuttallii*)
© 2004 Tom Greer

Ash-throated flycatcher (*Myiarchus cinerascens*) © 2007 Tom Greer

Figure IV-d (continued). Oak Woodland Focus Species

Hutton's vireo (*Vireo huttoni*)
© 2007 Stephen Dowlan

Western scrub-jay (*Aphelocoma californica*)
© 2005 Kim Cabrera

Yellow-billed magpie (*Pica nuttalli*)
© 2005 Stephen Dowlan

Oak titmouse (*Baeolophus inornatus*)
© 2007 Ron Wolf

White-breasted nuthatch (*Sitta carolinensis*) © 2006 Joyce Gross

Bewick's wren (*Thryomanes bewickii*)
© 2007 Ron Wolf

Figure IV-d (continued). Oak Woodland Focus Species

Blue-gray gnatcatcher (*Polioptila caerulea*) © 2007 Ron Wolf

Western bluebird (*Sialia mexicana*) © 2007 Tom Greer

California thrasher (*Toxostoma redivivum*) © 2007 Stephen Dowlan

European starling (*Sturnus vulgaris*) © 2007 John White

California towhee (*Pipilo crissalis*) © 2007 Ron Wolf

Lark sparrow (*Chondestes grammacus*) © 2007 Tom Greer

Constraints on Biological Monitoring Elements

Internal Constraints

As with other elements, limited funding for staff and operations is a major constraint on the biological monitoring element. Full realization of the monitoring goals and tasks will require an increase in funding for the Wildlife Area. To fully utilize student and community resources, a qualified biologist must coordinate and supervise research components.

External Constraints

Cooperative agreements with educational institutions and community partners to utilize facilities at the Balls Ferry Research and Education Center (IVE) have not yet been finalized. Biological monitoring tasks may be limited without the assistance of these partnerships.

Constraints on Biological Elements

The goals of the biological elements are constrained by a range of natural and human-induced factors. Effective management of the Wildlife Area requires that these factors be identified and considered. This plan recognizes that the Wildlife Area exists within the context of conflicting values and needs that are important to neighbors and users of the MCCWA as well as the people of California in general. Factors that affect the ability of the CDFG to attain the biological element goals are presented below.

Environmental factors

Large-scale events such as catastrophic flooding, climate change or wild fires are beyond the control of CDFG. Changes to local zoning ordinances could increase public use pressure upon the MCCWA.

Legal, political, or social factors

Watershed-scale management will be constrained by the willingness or ability of other public land managers and private landowners to cooperate. Private land owners may place values on their land that conflict with the goal of healthy ecosystem function. Other public land management agencies have missions and goals that differ from CDFG (for example, the adjacent Reading Island is owned by the U.S. Bureau of Land Management and offers primitive camping and recreational river access).

Financial factors

Limited funding for staffing and operations is the greatest existing management constraint for the Wildlife Area. This plan proposes management actions that will require an increase in funding and/or creative partnerships with local conservation groups and educational institutions.

D. Public Use Elements

Management goals pertaining to public access and use differ greatly between the Cottonwood Creek and the two Balls Ferry wetland units. The Cottonwood Creek Unit remains a primitive area with limited access that is primarily managed for its outstanding riparian habitat. Conversely, the recently acquired Balls Ferry Wetland Unit 1 is a more developed site that includes a house and other structures that make it uniquely suited for youth education programs, and its generally flat terrain makes it more easily accessible to people with disabilities. The entire unit is fenced; access is by permission only. The Balls Ferry Wetland Unit 2 continues to function as a working ranch; it will not be open to the public except by permission from CDFG (J. Chakarun, Area Manager, personal communication).

PHOTO: Public trail access point, Cottonwood Creek Unit. July 2005, SEI

Public use of all wildlife areas is regulated by the California Department of Fish and Game (CDFG) under California Code of Regulations (CCR), Title 14 (Natural Resources), Division 1, Sections 550 and 551. Division 1 contains regulations that have been formally adopted by the California Fish and Game Commission, reviewed and approved by the Office of Administrative Law, and filed with the Secretary of State. General public use of all wildlife areas is regulated

under Section 550. Activities related to hunting, permitting requirements and site-specific restrictions are regulated under Section 551.

All wildlife areas are classified as Type A, B, or C [§550]. Type A and B areas require specific permits or season passes whereas Type C areas usually do not. The Mouth of Cottonwood Creek Wildlife Area (MCCWA) is currently designated as a Type C area with no required permits or passes and no specified daily hunter capacity. Although regulations can be tailored to specific wildlife areas [§551q], Sections 550 and 551 should be viewed as a framework within which public use is addressed in this plan.

Compatible Public Use

It is the policy of the Fish and Game Commission that:

Lands under the administration of the Department be made available to the public for fishing, hunting or other forms of compatible wildlife dependent recreational use, and for scientific studies whenever such use or uses will not unduly interfere with the primary purpose for which such lands were acquired.

For the purposes of this policy, undue interference shall not mean that hunter and angler access to properties that would otherwise be available for access for passive recreational activities (i.e., bird watching, interpretive tours, etc.) is deemed to be necessarily incompatible. Further, hunting and fishing shall not be banned simply because a Department administered land was acquired primarily for the protection of various threatened and endangered species unless it can be clearly demonstrated that such activities would be likely to have a detrimental effect on listed species on the property in question. (California Fish and Game Commission 2002).

In keeping with this policy, the overall public use goal for the MCCWA is to protect biological resources while providing opportunities for recreational activities and scientific studies that do not have significant adverse impacts. Suitable recreational activities are those that are either wildlife-dependent or related, and that have low to moderate potential to negatively impact wildlife and other uses of the Wildlife Area. Using this criteria, compatible recreational activities at the MCCWA include hunting, fishing, day hiking, and nature observation (Table IV-b).

Table IV-b. Potential Recreational Activities at the MCCWA and Criteria Used to Determine Compatible Uses

RECREATIONAL ACTIVITY	RELATION TO WILDLIFE			Potential impact on habitat or wildlife	Potential conflict with other uses	Required level of management
	Dependent	Related	Unrelated			
Hunting	x			**Moderate**	**High**	**Moderate**
Fishing	x			**Low**	**Low**	**Low**
Day hiking		x		**Low**	**Low**	**Low**
Nature study, photography	x			**Low**	**Low**	**Low**

SOURCE: SEI 2007

Other forms of public recreation, including camping, dog training and field trials, horseback riding, mountain biking and off-highway vehicle use, are prohibited because of the potential negative impacts to wildlife, wildlife habitats, conflicts with other uses, and management demands [§551]. Regulations can be expected to change over time, so current regulations should be consulted for any determination about lawful use of a wildlife area. These regulations are available at the CDFG Web site and are published annually in a booklet.

1. Public Access Information and Education Element

Public entry is allowed from one hour before sunrise to one hour after sunset on the Cottonwood Creek Unit. Both of the Balls Ferry wetland units have been closed to the general public since their acquisition in 2004 and 2008. The future management strategy for the BFW1 is youth-oriented education with the intention of establishing the Balls Ferry Research and Education Center on site (IVE). BFW1 will remain a closed zone with public access by permit only. CDFG will issue permits for outdoor education programs, local birding groups, junior and disabled hunting programs, grazing leases aimed at controlling vegetation, and scientific study. There are no plans for public access for BFW2, which continues to function as a working ranch with grazing management under the oversight of the Western Shasta Resource Conservation District (Appendix E).

GOAL 1.1: Minimize conflicting public uses and facilitate authorized uses that are compatible with biological resource goals.

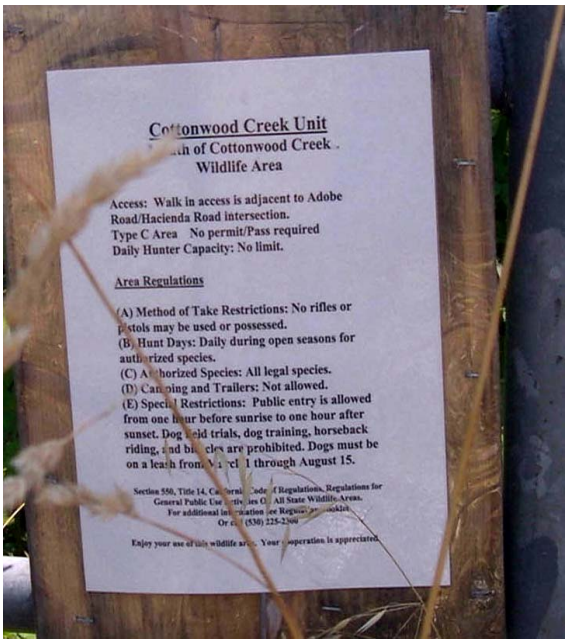


PHOTO: The sign for Cottonwood Creek Unit posts its public access and use regulations. July 2005, SEI,

TASK 1.1.1: Inform the public of wildlife area access, use designations, use restrictions and who to contact in an emergency through outreach, signage and CDFG Web site.

TASK 1.1.2: Add contact information on signage (including a name, phone number, email and Web site address) for directing questions, comments and suggestions about compatible uses at the MCCWA, and develop a procedure for tracking and following up on these contacts.

TASK 1.1.3: Develop pertinent recreation indicators for the MCCWA and use them to evaluate and report use levels and to conduct visitor interest and satisfaction surveys periodically.

TASK 1.1.4: Evaluate recreation activities and wildlife area regulations periodically to identify and report changes that are warranted to maintain consistency with MCCWA goals.

GOAL 1.2: Support use of the MCCWA by Native Americans for cultural purposes and activities such as gathering native plant materials.

TASK 1.2.1: Develop access plans and permits for Native Americans whose activities are compatible with the MCCWA goals, and ensure that permits include standard liability clauses.

GOAL 1.3: Facilitate safe use of the MCCWA by informing the public of potential risks and developing an emergency response plan.

TASK 1.3.1: Work with local, regional and state agencies to integrate the MCCWA into emergency communications and response plans (on file at North Coast Region's Redding office).

2. Hunting Element

The MCCWA provides hunting opportunities for all legal species, primarily waterfowl, pheasant, mourning dove and turkey. The BFW1 is closed to general public hunting, although special youth-oriented hunts and mobility-impaired hunts may be conducted in the future. The Cottonwood Creek Unit is currently operated as a Type C wildlife area whereby no permit or pass is required [§550 a]. Hunting is permitted on a daily basis during open season with no hunter quota. No rifles or pistols are permitted. No camping or trailers are permitted and public entry is restricted from one hour before sunrise to one hour after sunset. Dog training or field trials are not permitted and dogs must be leashed from March 1 through August 15 [§551q 14]. No hunting is allowed at BFW2.

PHOTO: A 4-H Just for Youth duck hunting event at San Diego Hunter Safety School.

GOAL 2.1: Provide a quality wildlife-dependent recreational experience using a renewable natural resource.

GOAL 2.2: Promote hunter education and ethics through information and enforcement of hunting regulations and compliance with compatibility determinations.

TASK 2.2.1: Inform the public of hunting times, locations and any special restrictions at the MCCWA through signage and the CDFG Web site.

TASK 2.2.2: Develop area maps identifying open and closed hunt areas.

TASK 2.2.3: Monitor hunter use by requiring hunters to provide a data count of the species taken.

TASK 2.2.4: Coordinate and conduct a volunteer “clean-up day” in late summer to ready the Wildlife Area for the upcoming hunting season.

TASK 2.2.5: Continue to maintain relationships among CDFG staff, hunters and volunteer organizations.

GOAL 2.3: Establish youth-oriented hunt programs for waterfowl, pheasant and mourning dove in cooperation with sport groups and volunteers.

TASK 2.3.1: Promote and support family events where adults participate together with children and youth in hunting experiences, providing encouragement and instruction.

TASK 2.3.2: Provide hunter safety courses on a regular basis at the Balls Ferry Research and Education Center (BFREC) (IVE).

TASK 2.3.3: Develop youth-oriented hunting opportunities at the BFREC (IVE).

GOAL 2.4: Promote mobility-impaired hunting programs such as waterfowl, pheasant and mourning dove.

TASK 2.4.1: Promote opportunities for people with mobility impairments to hunt waterfowl and upland game birds on BFW1 where physical barriers are reduced.

TASK 2.4.2: Develop special mobility-impaired hunting opportunities at the BFREC (IVE) through the Game Bird Heritage Special Hunt Program or other programs.

3. Fishing Element

Public fishing opportunities on the MCCWA are limited to Cottonwood Creek and the Sacramento River. Sport fishing typically occurs at the confluence of these two river systems for species such as trout, Chinook salmon, steelhead, black bass and catfish. Access is available by foot only and can be difficult due to the dense riparian habitat. Fishing in Cottonwood Creek is dependent on adequate flows and water year type. Regulations concerning these water bodies are covered in the CCR, Title 14, Freshwater Sport Fishing Regulations.

PHOTO: Boys fishing at the Kids Outdoor Sports Camp in Red Bluff, summer 2007.

The large pond on the BFW1 could provide angling opportunities for youth-oriented events and mobility impaired anglers in the future. BFW2 is closed to public use.

GOAL 3.1: Maintain healthy fish populations.

GOAL 3.2: Provide safe, compatible fishing opportunities to the public.

TASK 3.2.1: Post fishing regulations in appropriate locations.

TASK 3.2.2: Develop maps and signs that indicate fishing access points.

TASK 3.2.3: Develop youth-oriented angling opportunities.

TASK 3.2.4: Improve access for mobility-impaired anglers at BFW1, including the development of trails and facilities that meet standards under the Americans with Disabilities Act.

4. Day Hiking Element

PHOTO: Hiking down the foot trail to the Cottonwood Creek Unit. July 2005, SEI

Hiking is one of the more common recreational activities at the Cottonwood Creek Unit, although there are no marked or regularly maintained trails. There is one public access trail to the unit off Adobe Road just south of the juncture with Hacienda Road. Public hiking at BFW1 is not allowed at this time without permission from CDFG. There is no public access to BFW2.

GOAL 4.1: Continue to provide public hiking opportunities that avoid impacts to sensitive habitats.

GOAL 4.2: Educate hikers about sensitive habitats through interpretive mapping and, where necessary, signage.

TASK 4.2.1: Maintain physical separation of closed zones and sensitive habitats through passive barriers and landmarks, such as boulders along access roads and trails.

TASK 4.2.2: Develop a trail map that shows existing trail routes that do not conflict with sensitive areas in the Cottonwood Creek and BFW1 units.

TASK 4.2.3: Identify and develop new trail routes to avoid sensitive resources.

TASK 4.2.4: Conduct biannual inspections to look for signs of human disturbance on unmarked and undesignated trails.

TASK 4.2.5: Coordinate with special interest groups to develop an interpretive map of the Cottonwood Creek and BFW1 units that educates the public about habitat values.

5. Nature Observation Element

PHOTO: Young female Pacific Forktail captured by Ray Bruun at the Cottonwood Creek Unit in April 2008. Mr. Bruun visits the MCCWA and other northern California locations at least annually to observe, monitor and photograph dragonflies. ©Ray Bruun

The MCCWA provides excellent bird watching, photography and nature study opportunities. These types of activities are intimately tied to the quality of the wildlife habitat and the scenic resources of the area. Except for zones that may be closed for management purposes, public safety or resources protection, the Cottonwood Creek Unit is open on a walk-in basis for nature study, bird watching and nature photography. On the BFW1, CDFG will issue permits to local birding groups as well as for outdoor education programs. BFW2 is closed for management purposes.

GOAL 5.1: Maintain and improve opportunities for nature observation and other passive recreational activities at the MCCWA.

GOAL 5.2: Establish a means of capturing and sharing observations made by visitors to the MCCWA.

TASK 5.2.1: Improve low-impact access and install observation blinds at key points.

TASK 5.2.2: Maintain a current bird list for the MCCWA and provide this information to the general public in informational brochures and on the CDFG Web site.

TASK 5.2.3: Develop interpretive information about the natural history of the MCCWA.

TASK 5.2.4: Explore the possibility of establishing a MCCWA Web site or blog as a way to collect, maintain and share observations and data.

Constraints on Public Use Elements

The goals of the public use elements are constrained by a range of natural and human factors. Effective management of the Wildlife Area requires that these factors be identified and considered.

Environmental factors

Compatibility of public uses with biological goals depends on the intensity of use and the number of users. Uses that have negligible impacts on biological goals at current levels may have negative impacts at higher levels. Uses that are currently considered compatible may have to be curtailed in the future if they cause degradation of vegetation, erosion, or declines in populations of sensitive species.

While public access is an important component of CDFG's mission, protection of habitat and wildlife is the priority. Public use of the area must be balanced with habitat and wildlife protection.

Legal, political, or social factors

Different public uses have the potential to conflict with one another, especially if overall use of the MCCWA increases in the future. If conflicts develop, uses may need to be limited to specific areas or times of the year, or otherwise restricted.

Financial factors

Limited funding for staff and operations is a major constraint when managing public use. Public use goals and tasks were formulated under the assumption that the CDFG has or will obtain the funding to undertake these tasks.

E. Balls Ferry Research and Education Center Conceptual Plan Elements

The long-term vision for the Balls Ferry Wetland Unit 1 is the establishment of a research and education center with a focus on providing outdoor learning opportunities for youth . The site has a house and a variety of outbuildings that could be used for classes, potential group parking areas, and generally accessible topography. Local educational institutions have taken an active role in helping to conceptualize and develop research and outdoor learning programs at the site since the unit's acquisition in 2004.

PHOTO: ANTHS student testing water quality at the large pond on BFW1. McConnell Foundation

Historical Background

The California Department of Fish and Game acquired BFW1 from the Dymesich estate with the joint understanding that its ranch, wetlands and high wildlife values would provide a unique educational environment for young people. Building on years of discussions with the previous landowner, this vision was captured in the CDFG's Proposed Framework for the Balls Ferry Wetlands (Appendix I) shortly before it was acquired in 2004:

> The Department will designate the Balls Ferry wetlands as a unit of MCCWA. However, the management strategy will be different. The emphasis for Balls Ferry wetlands will be "youth" related with other specific activities. Because this strategy is a departure from "traditional" management of Department wildlife areas, partnerships and collaboration between numerous entities will be required. The departure on Balls Ferry will limit general public use while emphasizing and focusing on youth education, special youth hunts, and other appropriate activities.

The proposed management framework, along with subsequent documents in the administrative record (Appendix I), describes in further detail the CDFG's intention of establishing an outdoor education center on the site:

> The current infrastructure of the [BFW1] includes several buildings and outbuildings. Some of these structures could be converted into meeting and overnight facilities to accommodate educational programs and organized youth programs….These programs may range from sponsored field trips with local schools to week long "camps" that emphasize outdoor activities and conservation.
>
> The Balls Ferry facility will also be available for local schools to participate in "outdoor classroom" activities. Outdoor classroom programs generally take time to develop and will require interest and cooperation between local schools and the Department.

Around the time of BFW1 acquisition, the Anderson New Technology High School (ANTHS) was emerging as a project-based charter school focused on providing integrated curriculum in "real world" community environments. Discussions ensued between CDFG staff, ANTHS faculty and students, and the McConnell Foundation and resulted in a draft conceptual plan and memorandum of understanding (MOU) regarding shared management responsibilities (Appendix I). The initial agreement was that ANTHS faculty would take the lead on educational components, including the development of curricula specific to collecting baseline data on BFW1, piloting educational formats on behalf of Shasta County schools, providing staff development, and assisting with community outreach. CDFG would take primary responsibility for the development and operation of the area, including the drafting of a management plan to direct these activities, as follows:

> Within this plan, background information will include a description of the process which led to the acquisition of the property. A youth hunting program will be implemented. Baseline biological information, used to make informed decisions, will be obtained from ANTHS student researchers. Student research will include an inventory of plant and animal species. Habitats will be mapped using a Geographic Information System. Atmospheric conditions will be monitored. Hydrology and water quality will be assessed. Soils will be sampled and described. The impacts of grazing will be studied. The plan will periodically be reviewed and updated as new information becomes available.

Both CDFG and ANTHS proceeded in this direction in 2005. ANTHS faculty developed a year-long integrated curriculum for mapping resources, collecting baseline data and conducting historical research on BFW1. CDFG set management objectives that included formalizing partnerships with ANTHS and Shasta College, hiring an outdoor educational coordinator, and assessing facility and equipment needs. However, changes in personnel at both CDFG and ANTHS put the joint project on hold. Recent conversations with ANTHS faculty indicate continued interest in BFW1 (S. Main, ANTHS, personal communication). In May 2008, two ANTHS students who had spent time at BFW1 during their four years at the school developed a senior project to take a busload of seventh graders from Anderson Middle School to the unit for an environmental education day — an example of the tiered environmental education, career development and mentoring possibilities possible at the site.

PHOTO: Anderson New Technology High School students conducting experiments in the biolab. McConnell Foundation.

Shasta College has also been involved in educational opportunities at MCCWA through its Natural Resources technician-level degree program, identifying plants and conducting bird surveys (K. Nolte, Shasta College, personal communication). CDFG staff has discussed the possibility of developing a more formal relationship with the college.

Previous land managers at the MCCWA have also explored possibilities of working with California State University, Chico (CSU, Chico). The university's Research Foundation helps manage other ecological areas in partnership with CDFG, and Chico State students have been involved in a previous restoration project on the Cottonwood Creek Unit.

BFREC Conceptual Plan

The Balls Ferry Research and Education Center (BRFEC) Conceptual Plan presented here is based on the existing administrative record (Appendix I) as well as discussions with people involved in the property acquisition and initial visioning efforts. The conceptual plan is intended to achieve the following purposes:

- To protect, enhance and develop riparian, wetland and upland habitats at the MCCWA specifically and in the region generally..
- To provide opportunities for scientific research that will support MCCWA adaptive management goals and provide useful biological information to land managers, regional conservation planners, and researchers in general.
- To provide educational opportunities and programs for the benefit of local youth and for the benefit of the community in general.
- To provide additional access opportunities for disabled youth and adults.

The goals in this section should be understood as general guidelines for developing the various levels of educational and scientific research opportunities envisioned for the BFREC. Tasks are coordinated with the goals and tasks presented in the other management elements of the MCCWA LMP and reflect new information based on research conducted in support of this plan. Following the goals and tasks is specific information on the local and regional groups that have expressed interest in supporting efforts at the site, as well as potential constraints on implementation.

1. Sustainability and Strategic Planning Element

GOAL 1.1: Develop a long-term sustainable plan for expanding youth educational opportunities .

TASK 1.1.1: Assemble a steering committee to guide the development of programs for the BFREC.

TASK 1.1.2: Research and identify funding and in-kind resources to support the BFREC.

TASK 1.1.3: Explore the development of a Web site to share information, resources and opportunities at the BFREC.

TASK 1.1.4: Assess the feasibility of providing week-long youth camps at the site, including use of existing residential buildings for overnight stays and/or developing a camping area.

GOAL 1.2: Retain a research and education coordinator to oversee activities and programs at the center.

TASK 1.2.1: Develop a job description that defines the roles and responsibilities of a research and education coordinator for overseeing research activities and outdoor education at the BFREC.

TASK 1.2.2: Explore grant funding, cooperative management arrangements or job sharing possibilities to fill the research and education coordinator position.

2. Research and Monitoring Coordination Element

GOAL 2.1: Develop a quality assurance and quality control plan for utilizing student resources for conducting research, monitoring and restoration at MCCWA.

TASK 2.1.1: Review all elements in the MCCWA Land Management Plan to identify educational/interpretive, research, monitoring and restoration needs.

TASK 2.1.2: Prioritize needs and define expertise levels needed to accomplish work.

TASK 2.1.3: Conduct initial high priority research in house or promote and encourage research projects on these topics.

TASK 2.1.4: Establish protocol guidelines for use by researchers and field technicians, including integration of research into CDFG-preferred databases.

TASK 2.1.5: Incorporate GLOBE program standards (Appendix J) for the scientifically valid atmospheric, hydrologic soils and land cover/phenology measurements.

TASK 2.1.6: Identify and assess experimental design opportunities (including remote sensing) to be incorporated into habitat and species management, restoration, and/or reintroduction projects on the MCCWA.

TASK 2.1.7: Explore the possibility of undertaking long-term studies of the following at MCCWA:

- Ecology of managed wetlands
- Agro-ecology
- Wildlife-friendly agricultural practices
- Vernal pool ecology and management
- Native grassland ecology and management, including management of grazing to enhance native species diversity
- Invasive species management
- Trends in abundance of migrant and/or wintering waterfowl and shorebirds, in support of regional population monitoring throughout the Pacific Flyway
- Trends in abundance, reproduction, survival, and/or habitat use by special-status and game species

GOAL 2.2: Integrate and coordinate colleges, government and community resources into the research and educational program.

TASK 2.2.1: Formalize partnerships with ANTHS, Shasta College and CSU, Chico to provide baseline data collection, monitoring and technical assistance at the MCCWA.

TASK 2.2.2: Develop an agreement with Wintu Audubon Society to provide bird counts and offer technical assistance in connection with student monitoring (IVC).

3. Youth Educational Programs Development Element

GOAL 3.1: Establish the BFREC as an"outdoor classroom" available to local schools.

TASK 3.1.1: Formalize the partnership with ANTHS and Shasta County Office of Education to collaboratively develop and test educational formats for programs at the BFREC that can be expanded to other schools and groups.

- Define roles and responsibilities of agencies
- Address personnel needs
- Assign maintenance and custodial tasks
- Adopt rules for operating area

TASK 3.1.2: Provide copies of the MCCWA LMP to ANTHS faculty to guide the development of educational formats.

TASK 3.1.3: Conduct a safety survey and prepare a safety plan.

TASK 3.1.4: Provide a relatively secure and controlled environment for youth outdoor education.

TASK 3.1.5: Facilitate access to parking and facilities.

TASK 3.1.6: Develop trail system to make resources accessible to students while avoiding impacts to sensitive resources.

TASK 3.1.7: Develop safe access to wetland areas for research and educational activities.

TASK 3.1.8: Assess needs for educational and research tools and supplies, including water quality equipment, binoculars and scopes, GPS units, laptops, field guides, tables and chairs.

TASK 3.1.9: Assess needs for portable bathrooms, including handicap accessibility.

GOAL 3.2: Develop hunting and fishing programs, as appropriate, aimed at youth, mobility-impaired individuals and other underserved populations.

TASK 3.2.1: Restrict public access to provide secure, controlled environment for youth outdoor education.

TASK 3.2.2: Assess safety and neighboring landowner issues associated with developing a Junior Hunt program.

TASK 3.2.3: Utilize the resources of the junior hunt coordinator in CDFG's Game Bird Heritage Special Hunt Division.

TASK 3.2.4: Assess continued interest of Shasta County Sportsmen's Association and other regional hunting and fishing groups to assist with youth-only waterfowl hunts and fly fishing.

TASK 3.2.5: Consider partnerships with the California Waterfowl Association, Ducks Unlimited, and California 4-H Shooting Sports to develop youth hunting education activities appropriate to the site, including ethical hunter conservation education programs.

GOAL 3.3: Provide agricultural education opportunities as appropriate.

TASK 3.3.1: Explore partnership possibilities with UCCE for using existing barns and irrigated fields for 4H and Future Farmers of America (FFA) groups.

TASK 3.3.2: Develop a demonstration grazing regime to control invasive plants and increase native plant composition (IVF3; Appendix E).

4. Research and Education Facilities Use Element

GOAL 4.1: Adapt existing residential buildings and outbuildings for use as educational and research facilities.

TASK 4.1.1: Conduct a feasibility analysis for continuing conversion of site facilities for the BFREC, including classrooms, a biological chemical laboratory, a computer laboratory, outdoor educational stations, and overnight accommodations.

TASK 4.1.2: Green existing facilities and structures to keep impacts below previous use levels.

TASK 4.1.3: Establish access and capacity levels to keep impacts at or below previous use levels.

TASK 4.1.4: Assess benefits of developing facilities as a model of green conversion under Leadership in Energy and Environmental Design (LEED) or Coalition for High Performance Schools (CHPS) standards.

LEED® GREEN BUILDING CONVERSION AT BALLS FERRY WETLAND UNIT 1

The LEED Green Building Rating System is a voluntary, consensus-based national rating system for developing high-performance, sustainable buildings. LEED addresses all building types, including existing buildings, in five areas: sustainable site development, water savings, energy efficiency, materials and resources selection, and indoor environmental quality. CHPS standards facilitate the modernization of high performance schools, learning environments that are not only efficient but also healthy, comfortable and well-lit.

Environmental benefits:
- Enhance and protect ecosystems and biodiversity
- Improve air and water quality
- Reduce solid waste
- Conserve natural resources

Economic benefits:
- Reduce operating costs
- Enhance asset value and profits
- Improve employee productivity and satisfaction
- Optimize life-cycle economic performance

Health and community benefits:
- Improve air, thermal, and acoustic environments
- Enhance occupant comfort and health
- Minimize strain on local infrastructure
- Contribute to overall quality of life

Interested Local and Regional Partners

The uniqueness of BFW1 and its facilities, along with its suitability for youth, has inspired the interest of educational, research and recreational groups in the region. Those who have expressed direct interests in a research and education center on the site, or in adapting current curricula or developing new curriculum in conjunction with outdoor learning and research opportunities at MCCWA are discussed below.

K-12 Schools

- Anderson New Technology High School (ANTHS) has taken the lead in establishing a formal partnership with CDFG to provide research and monitoring assistance at the Balls Ferry site while providing students with the opportunity to develop career pathways. Faculty developed a comprehensive year-long curriculum specific to the MCCWA for mapping resources, collecting baseline data, conducting research and developing restoration. ANTHS faculty has expressed interest in developing and testing educational formats for Shasta County schools and coordinating work with GLOBE (Appendix I).
- Shasta County Office of Education currently provides environmental education resources through Camp Latieze in Lassen, the Schreder Planetarium in Redding, and Whiskeytown Environmental School on Clear Creek below Whiskeytown Dam. The county office of education also coordinates efforts CREEC's Northeastern Region.

Community Colleges

- Shasta College offers an associate degree in Natural Resources and a Watershed Certificate program that are designed to provide technician-level training (Appendix I). It also offers a Forestry degree and participates in CDFG Career Day. In the past, faculty member Ken Nolte has brought wildlife classes to MCCWA to conduct bird surveys and identify plants. He has expressed interest in doing long-term monitoring, perhaps including deer tracking using radio telemetry.
- Sacramento City College Field Ecology Certificate Program offers another model for providing student training and research assistance that

Universities

- California State University, Chico secured a grant to plant trees to restore part of the Great Valley riparian habitat on the Cottonwood Creek Unit.
- In 2005, CDFG's North Coast Region explored the possibility of establishing an arrangement with CSU, Chico to cooperatively manage the MCCWA (Appendix I). The Big Chico Creek Ecological Reserve (BCCER), owned by the CSU, Chico Research Foundation, is managed by CSU, Chico's Institute for Sustainable Development. The Research Foundation purchased the land with grant money from the Wildlife Conservation Board, the Packard Foundation, USFWS, the National Fish and Wildlife Foundation, the River Network and Jack Henning. Part of the purchase agreement included a conservation easement held by the Wildlife Conservation Board and a Memorandum of Understanding with CDFG.

Regional Conservation Agencies

- Western Shasta Resource Conservation District offers educational and outreach assistance for all age levels, and could provide its expertise and resources in support of the BFREC. It operates the Whiskeytown Environmental School as a joint project with the National Park Service. It sponsors the Clear Creek Student Restoration and Monitoring effort and Kids in the Creek.
- Shasta County University of California Cooperative Extension has expressed interest in providing an educational program on livestock grazing as a vegetation management tool. The UC Extension office also sponsors youth education and development programs, including 4H and Future Farmers of America (FFA).

Nonprofit Conservation Education Programs

- The Cottonwood Creek Watershed Group (CCWG) offers Kids for Our Creek, a science-based educational program for public, private and home school students in grades K-8. Focusing on local watershed issues, it uses a variety of nationally recognized curricula, such as Project WILD Aquatic, Project Learning Tree, and National Wildlife Federation's Access Nature. For the outdoor portion of the program, students visit various sites in the watershed to apply the curriculum to real world situations. The CCWG also plans and implements conservation and restoration projects throughout the watershed with students, teachers and parents directly involved in deciding which projects to undertake, gathering data, and carrying out restoration work.
- Adopt-A-Watershed (AAW) is a non-profit organization that promotes educational enhancement, environmental stewardship, and community development through Place-Based Learning. AAW works with schools, youth education programs, community groups, and environmental organizations throughout California. AAW is actively involved in the Cottonwood Creek Watershed Group and attended early planning meetings that envisioned the BFREC.
- The California Waterfowl Association sponsors a Wood Duck Program at the Turtle Bay Museum in Redding. Habitat conditions at the MCCWA and the facilities at BFW1 make this conservation education program for young people a good fit.
- Shasta-Tehama Shed Heads is a group whose goal is to enhance, restore, conserve and improve the interrelated environmental and economic resources of both Shasta and Tehama counties. Through collaborative efforts, this organization attempts to provide for the social, financial and aesthetic needs of all county residents while at the same time protecting the natural environment which sustains our communities and provides for their needs.

User Groups

- Wintu Audubon Society is very active in the region, assisting with conservation science monitoring efforts and regularly offering birding trips for both novice and experienced birders to nearby Reading Island. The chapter has expressed interest in helping CDFG with breeding bird surveys, point counts and monitoring at the MCCWA.

- Shasta County Sportsmen's Association has expressed interest in sponsoring a youth hunt and a mobility-impaired hunt at BFW1. Since the mid-1990s, Shasta County Sportsmen's Association has sponsored Youth Pheasant Hunts and Women's Pheasant Hunts in conjunction with CDFG and the Bureau of Land Management's (BLM) Redding Field Office. It offered its first mobility-impaired pheasant hunt in 2007.

Constraints on the BFREC Element

The BFREC represents a new management direction for CDFG-managed wildlife areas, making it difficult to fully estimate the effects of such an undertaking.

Environmental factors

While public access is an important component in the CDFG's mission, protection of habitat and wildlife is the priority. Public use of the area must be balanced with habitat and wildlife protection. BFREC is intended to be fully compatible with and augment the full implementation of the biological goals.

Criteria for assessing compatibility of research and education projects

The following criteria can be used to assess the compatibility of the proposed research projects:

- Research is designed to improve management of the MCCWA units (or other wildlife areas)
- Potential conflicts between the research and compatible public uses
- Potential conflicts between the research and any biological goals stated in this LMP
- Potential for the research to interfere with or preclude certain types of future research at the MCCWA unit(s)
- Use of scientifically valid and CDFG-approved research and monitoring protocol and mapping

Legal, political, or social factors

CDFG staff identified two major constraints unique to this sub-element encountered during previous attempts to implement K-12 programs at BFW1: (1) lack of regular transportation options for youth, and (2) lack of a curriculum for 9-12 grades. Resources available to address the latter of these considerations are discussed in this element.

Different public uses have the potential to conflict with one another, especially if overall use of the Mouth of Cottonwood Creek Wildlife Area increases in the future. If conflicts develop, uses may need to be limited to specific areas or times of the year, or otherwise restricted.

Financial factors

Implementation of the BFREC includes structural upgrades to BFW1, including parking, trails, and conversion of existing buildings for educational uses. Limited funding for staff and operations is a major constraint for implementation of this sub-element. Public use goals and tasks were formulated under the assumption that the CDFG has or will obtain the funding to undertake these tasks.

F. Facility Maintenance Elements

Facilities management is a critical component of the Mouth of Cottonwood Creek Wildlife Area. As isolated habitat islands within a rural residential zone, the Wildlife Area will require active management to maintain and restore the structure and species associated with each of the biological elements. This section details the components of facilities management necessary to achieve implementation of the biological goals as well as the unique public use element envisioned at the Balls Ferry Wetland Unit 1.

The effective management of the Mouth of Cottonwood Creek Wildlife Area (MCCWA) will require establishing a regular facility maintenance program to meet the goals of the public use and biological elements. Existing facilities at the MCCWA that will require regular maintenance include a small network of trails, access roads, a parking area, fencing, gates, and several buildings and structures. Routine maintenance will also be required on water control structures for irrigation purposes. Some existing structures may also require renovation for safety, compliance with the Americans with Disabilities Act (ADA), and to meet the goals of the Balls Ferry Research and Education Center (BFREC) (IVE). Without adequate maintenance, public and employee safety may be jeopardized, wetlands can be degraded or lost, and wildlife habitat may decline in value and quantity.

1. Health and Safety Element

GOAL 1.1: Provide a safe environment for wildlife and for public use.

TASK 1.1.1: Establish an annual monitoring and reporting program of wildlife area facilities (e.g., condition of signs, structures, fences).

TASK 1.1.2: Fix or replace facilities as needed, and develop a facility management approach based on the results of the annual monitoring program.

TASK 1.1.3: Ensure that facilities maintenance actions comply with the ESA, CESA and other regulations aimed at the protection of special-status species and/or sensitive habitats.

TASK 1.1.4: Document facility needs in the CDFG's maintenance and capital outlay database.

GOAL 1.2: Discourage destructive and illegal public use of the Wildlife Area through enforcement of regulations.

TASK 1.2.1: Monitor the magnitude and type of illegal public use, such as trespass, off-road vehicle use or out of season hunting. Encourage increased CDFG warden presence in the Wildlife Area, as well as increasing the frequency of the assignment of penalties. Request assistance from the county sheriff as necessary to enforce laws.

2. Fire Management

The MCCWA is under the jurisdiction of the local Cottonwood Volunteer Fire Department (CVFD). The CVFD is the first responder to any fire outbreaks, backed up by other local agencies, and finally by California Department of Forestry and Fire Protection (CAL FIRE) crews (R. Armstrong, Chief, Cottonwood Fire Department, personal communication).

The fire history for this area is unknown, but presumed to be rare due to the proximity of the Sacramento River, Cottonwood Creek, and various irrigation ditches and water conveyance structures. Management activities at the MCCWA may include prescriptive burning for vegetation management and creation of firebreaks to provide effective containment. Since the Wildlife Area is essentially an island of wildland habitat surrounded by rural residential development, management coordination with the local first responders is imperative. There is currently no fire management plan for the MCCWA.

Prescriptive burns require a permit from the Shasta County Air Quality Management District (SCAQMD), Department of Resource Management, and must be coordinated with the CVFD (SCAQMD 2005). Guidelines and permit requirements for open burning are posted on the Shasta County AQMD Web site. For prescribed burns that are greater than 10 acres or that would produce more than 1 ton of particulate matter emissions, the SCAQMD requires a smoke management plan to be filed along with payment of burn permit fees (ibid).

GOAL 2.1: Manage the Wildlife Area to optimize wildlife habitat conditions while protecting people and property.

TASK 2.1.1. Develop and implement a wildfire management plan for the MCCWA. The management plan will coordinate with the SCAQMD, CVFD and implement the policies outlined in the Interim Joint Policy on Pre, During and Post Fire Activities and Wildlife Habitat (California Fish and Game Commission and California State Board of Forestry 1994). The wildlife management plan will include the following:

- Contact information for CDFG managers and local fire response teams.
- Maps that show boundaries, emergency access points and water sources for local fire authorities.
- Maps of sensitive biological resources that require careful consideration during a fire incident.

TASK 2.1.2: Coordinate and meet annually with local fire agencies to develop and update wildfire response procedures including vegetation management, recent fires events, and contact information.

TASK 2.1.3: Design and implement vegetation management strategies, including:

- Establishing firebreaks along existing roads, parking lots, and existing structures.
- Using livestock grazing as appropriate to manage fuel load.
- Maintaining at least 100 feet of defensible space between structures and flammable vegetation.
- Storing woodpiles and other flammable materials away from structures.

TASK 2.1.4: Identify water sources that could be used strictly for emergency purposes that would save lives and property. Install an auxiliary water tank and pump if necessary.

TASK 2.1.5: Install fire extinguishers and smoke alarms in all occupied structures. Equip chimneys with spark arrestors and clean roofs and gutters of leaves.

TASK 2.1.6: Following fire and fire suppression events, implement emergency restoration to sensitive habitat areas and structures as needed.

TASK 2.1.7: Identify all areas that may be candidates for prescribed fire or pre-fire activities and implement policies outlined in the Interim Joint Policy of the California Fish and Game Commission and the California State Board of Forestry (1994).

3. Vegetation Management and Grazing

Grazing by native herbivores (deer, elk, bison, or antelope), along with naturally occurring and deliberately set fires, have heavily influenced California's ecological landscape. Many native plants have adapted to and actually benefited from those influences. The introduction of European grasses and forbs by early Spanish and Anglo settlers, traditional cattle grazing practices, loss of native grazing animals, and fire suppression policies have resulted in the virtual replacement of the original grassland vegetation with a predominately alien flora. This nonnative vegetation is more competitive, productive and prolific than the native plants with which it coexists. Nonnative grasses grow rapidly and densely to heights of three feet or more, and present an acute fire safety hazard. In the absence of the native ungulate population, managed domestic livestock grazing is a viable alternative to achieve both fire safety objectives and maintain and restore natural plant communities.

Grazing Leases. The Cottonwood Creek Unit is designated primarily for wildlife management and has no active grazing lease. On both Balls Ferry wetland units, grazing is an historical use, and is considered a management strategy to control invasive non-native plants, reduce and manage fuel loads, and provide added management income.

The most recent grazing lease for BFW1 encompassed 240 acres, including 14 acres of irrigated pasture and 18 acres of wetlands. The terms of the lease allowed year-round use, with a maximum of 40 animal units per month (AUM). The grazing lease included maintenance and repair of all fences, cattle guards, gates and other improvements upon the leased lands. Additionally, the grazing lease included repair and maintenance of water delivery equipment and payments for the water delivery from ACID for biweekly flood irrigation. Grazing leases for BFW1 were previously renewed on an annual basis (CDFG internal files). Any future leases at BFW1 will likely be administered by the Western Shasta Resource Conservation District (WSRCD).

The recent lessee at BFW1 operated a cow-calf operation for three consecutive years. Cattle were rotated from annual grassland pastures from April thru July depending on the grass availability. Cows were scheduled to calf from mid-June through July when grass sources were high. During peak growing season, the lessee ran the maximum allotted 40 AUMs. Although the lease allowed up to 40 AUM, this number was adjusted according to the grass availability. During the late summer and fall months when grasses became depleted, some cattle were moved off site to reduce pasture stress. The remaining cattle were then moved to the irrigated pasture for grazing (D. Stroing, grazing lessee, personal communication).

BFW2 grazing lease is managed by the WSRCD on the behalf of CDFG, in accordance with the Balls Ferry Wetlands Unit 2 Grazing Management Plan (WSRCD 2009) (Appendix E). BFW2 includes approximately 106 acres of irrigated pasture and hay fields. The lease agreement includes grazing rights, harvesting hay, irrigation and maintenance of the facilities (all costs borne by lessee). It is the prerogative of the lessee to determine the amount of grazing and/or haying operations that occur in any given season. The WSRCD and the University of California Cooperative Extension (UCCE) Program periodically monitor the site to ensure that plant vigor is maintained and that a vegetation stubble height of 3-4 inch is available by November 1 for migrating waterfowl. The lease terms are five years, with an annual renewal clause. The lessee is additionally responsible for preparing an annual management plan that can be adjusted during the season based on monitoring data and/or site visits, and to manage the site in accordance with good husbandry and ranching practices (WSRCD Lease Agreement #CO-219, on file with CDFG).

PHOTO: Northwest side of BWF2 is grazed and partially hayed. This grazing lease is managed by the Western Shasta Resource Conservation District. 2009, SEI

PHOTO: Northeast hayfield of BWF2. Concrete pipe is part of ACID irrigation system. 2009, SEI

PHOTO: Northwest corner. Posts through center mark underground irrigation pipe. All grazed. 2009, SEI

PHOTO: Close-up of northeast hayfield. Three poles mark the monitoring station for WSRCD. 2009, SEI

GOAL 3.1: Maintain a livestock grazing regime for invasive plant control, fuel management, and promote native plant restoration.

TASK 3.1.1: Provide additional cross fencing to distribute animal impacts and utilize existing forage.

TASK 3.1.2: Introduce perennial grass and legume components to pasture forage mix to increase nutrition and pasture health.

TASK 3.1.3: Time pasture irrigation with animal movement to minimize soil compaction and maximize plant recovery on resting pasture.

TASK 3.1.4: Fence ponds and riparian areas to minimize grazing impacts, and improve wetland health.

TASK 3.1.5: Provide livestock watering troughs away from wetland and riparian habitats.

GOAL 3.2: Provide opportunities for range management research and education at the Balls Ferry Education and Research Center.

TASK 3.2.1: Work with WSRCD and grazing lessee(s) to design and implement a grazing management and monitoring plan that meets CDFG habitat management goals with consideration to the economic goals of the livestock owners (Appendix E).

TASK 3.2.2: Consider establishing a MOU with external agencies or non-profit organizations to assume oversight of grazing lease at BFW1.

TASK 3.2.3: Consider establishing a MOU with UCCE for use of facilities for student agriculture projects.

TASK 3.2.4: Evaluate grazing as a vegetation management tool on the Cottonwood Creek Unit.

TASK 3.2.5: Explore opportunities for long-term grazing leases to incorporate habitat monitoring and adaptive management strategies.

4. Vector Control

Insects or other arthropods that transmit diseases or discomfort to humans, their pets and livestock are called vectors. Mosquitoes are the most important vectors of human disease worldwide, responsible for about 1.5 million deaths per year from mosquito-borne malaria alone (Center for Disease Control [CDC] 2007). Other important diseases that are transmitted by mosquitoes to humans include West Nile Virus, dengue hemorrhagic fever, yellow fever, and a number of types of encephalitis. Recent attention has been focused on controlling the spread of West Nile Virus, which has killed over 300 species of birds and also infects horses throughout the United States (ibid).

Other important disease vectors include fleas (which can transmit diseases such as bubonic plague) and ticks (which can transmit Lyme disease, human granulocytic ehrlichiosis [HGE] and babesiosis). Lyme disease, the most well known of these tick-borne diseases, is caused by the spirochete bacterium, *Borrelia burgdorferi.* In the western United States, the *Borrelia* bacterium is carried by the Western blacklegged tick, *Ixodes pacificus*. Infected specimens of this species of tick have been found throughout most of California (California Department of Public Health 2009).

California Fish and Game Code § 1507 contains language pertaining to mosquito control in managed wetlands in CDFG's wildlife areas. While there is currently no statewide program for Lyme disease control or prevention, the California Department of Public Health provides a Web site with important information and links that is available to the public. Public education and protection from tick bites are the primary methods to prevent contracting Lyme disease.

GOAL 4.1: Maintain or enhance habitat values for waterfowl and other wildlife through proper water management and minimize the use of chemical treatments or other non-biological mosquito control.

TASK 4.1.1: In consultation with Shasta Mosquito Vector Control District (SMVCD), implement a mosquito control plan that applies best management practices (BMPs) identified in the Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands (Kwasny et al. 2004).

GOAL4.2: Maintain and protect humans, domestic animals and wildlife from vector-borne diseases such as West Nile Virus and Lyme Disease.

TASK 4.2.1: Post tick identification and Lyme disease prevention signs at public access points to the Wildlife Area.

GOAL 4.4: Minimize financial costs to CDFG by coordinating with regional mosquito and vector control efforts.

TASK 4.4.1: Communicate regularly with SMVCD and CDHS.

TASK 4.4.2: Meet annually with mosquito abatement agencies to discuss needed infrastructure improvements, identify areas of high mosquito productivity, schedules of summer irrigations and fall flood up, and scheduling of public use activities.

TASK 4.4.3: Support regional and local academic research regarding vector-borne illnesses.

5. Water and Flood Management

The MCCWA contains a mix of natural and created wetland habitats, connected through a series of irrigation ditches and canals. These wetland habitats provide important habitat for waterfowl and other native species, and provide educational and recreational opportunities important to area managers.

Water flows through the Wildlife Area from offsite hydrological features, and is also provided by a series of irrigation ditches and pumps maintained by the Anderson-Cottonwood Irrigation District (ACID). The irrigation district bills annually, in advance, for its water deliveries based on the number of acres irrigated and the assumption that each 5 cfs will irrigate 1 acre per hour. Thus users are allotted a specific number of hours during which water is provided, based on the flow measured at the delivery point and the number of acres to be irrigated. Each customer receives water approximately every two weeks throughout the irrigation season. For example, if the customer applies for water on 100 acres and the delivery flow is 20 cfs, water will be provided for 25 hours during each two-week rotation (20 cfs = 4 acres per hour). If desired, CDFG could purchase water for 1059 acres per year from ACID for irrigation and maintenance of the wetland habitats (S. Wangberg, ACID manager, personal communication).

The Cottonwood Creek Unit of the MCCWA is located almost entirely within the 100-year flood-plain of Cottonwood Creek as well as the Sacramento River (Shasta County General Plan 2004). Cottonwood Creek experiences regular and large flood events and as a result, the creek's channel alignment shifts often, especially along the lower reach between Interstate 5 and the confluence of the Sacramento River (Graham Matthews & Associates 2003). The flood and scour patterns of Cottonwood Creek have created a series of meander channels, oxbows, and cut off ponds, and

have deposited large amounts of sediment at the Creek mouth. This natural disturbance regime has contributed to the variety of habitats of the Cottonwood Creek Unit and is an important contributor to the overall health of the Sacramento River ecosystem (CALFED 2000).

Shasta County regulates development within floodplains through zoning that addresses land use, density and structure siting. The county's general plan includes goals for resource conservation (including restoration and conservation of riparian habitat along the floodplain), preservation of scenic values, and protection of public health and safety (Shasta County General Plan 2004).

CDFG's management of the MCCWA is consistent with the Shasta County General Plan, placing a priority on public safety and resource protection. During flood events, CDFG coordinates with the Division of Flood Management, California Department of Water Resources (DWR), a joint state and federal program designed to prevent loss of life and reduce property damage caused by floods and to assist in recovery efforts following any natural disaster.

GOAL 5.1: Maintain the variety and diversity of wetland habitats at the MCCWA for optimal wildlife habitat.

TASK 5.1.1: Ensure that actions comply with the ESA, CESA and other regulations aimed at the protection of special-status species and/or sensitive habitats.

TASK 5.1.2: Coordinate water deliveries to enhance wetland habitat values with ACID.

GOAL 5.2: Restore and enhance aquatic ecosystems to conditions that provide desired ecological functions.

TASK 5.2.1: Monitor the condition and use of existing irrigation canals and check gates monthly.

TASK 5.2.2: Take actions as needed to keep desired facilities/structures in good repair.

TASK 5.2.3: Take actions to demolish and remove those structures that are unauthorized or have become unsafe or undesirable.

GOAL 5.3: Manage and operate the MCCWA in coordination with state, federal and local flood management plans.

TASK 5.3.1: Maintain accurate records of water deliveries, management and maintenance actions, as well as the associated costs.

TASK 5.3.2: Upon notification of a major flood event, initiate flood response protocol including removal of portable structures onsite, removal of check gates (if necessary) and posting flood closure information onsite and on the CDFG Web site.

6. Access Roads, Parking and Trails

The MCCWA does not have direct public road access and has a limited, unimproved trail network. Access to the Cottonwood Creek Unit is provided by two unimproved gated roads, which are closed to the general public. These roads provide access for ACID, PG&E, and CDFG staff. There is one unpaved public parking area for up to eight vehicles is available at the Cottonwood Creek Unit on the south side of Adobe Road near the junction of Hacienda Road. A marked trail provides pedestrian access from the parking lot to the Cottonwood Creek Unit along the eastern edge of the unit.

The unimproved access roads on BFW1 and BFW2 are also limited to use by CDFG employees, ACID, PG&E and the grazing lessees. Parking for special use at BFW1 is limited to unimproved areas around existing structures and facilities. There is no public access at BFW2 (J. Chakarun, CDFG, personal communication).

GOAL 6.1: Provide manageable public and private use of existing roads, parking areas, and trails.

TASK 6.1.1: Prepare public access improvement plan that includes maintenance, and as necessary, improvement of existing roads and trails.

TASK 6.1.2: Maintain existing access roads and trails through herbicide spraying, mowing, graveling, and minor rut repair prior to (or after) the bird-nesting season.

TASK 6.1.3: Maintain and improve existing parking area and trail system at the Cottonwood Creek Unit and BFW1.

GOAL 6.2: Improve access for people with disabilities.

TASK 6.2.1: Identify special parking needs on BFW1 and make improvements as required.

TASK 6.2.2: Develop ADA boardwalk and observation blind for BFW1.

7. Signage, Fencing and Gates

Fencing, gates, and signs are used to denote MCCWA boundaries, to restrict public access, and to contain management activities such as livestock grazing. The Cottonwood Creek Unit still has some internal fencing (left from prior ownership) that may present hazards to wildlife and public safety. Fencing at BFW1 is used to divide grazing pastures and limit livestock access to wetlands and existing residential structures. There are no internal fences at BFW2. A map of existing fencing on BFW1 is provided the property description of this plan (IID, Figure 1I-n).

GOAL 7.1: Protect and improve the wildlife and habitat values on the MCCWA.

TASK 7.1.1: Survey existing fencing and gates and improve where necessary.

TASK 7.1.2: Identify and remove obsolete internal fencing materials.

TASK 7.1.3: Implement grazing management plan for both Balls Ferry wetland units that includes pasture rotation and exclusionary fencing to protect riparian and wetland resources (IVF3, Appendix E).

GOAL 7.2: Identify the boundaries of the MCCWA.

TASK 7.2.1: Survey boundaries and place permanent corner markers on all units of the MCCWA.

TASK 7.2.2: Inventory existing boundary signage, and install new signs where necessary.

GOAL 7.3: Inform the public of laws and regulations applicable to the Wildlife Area.

TASK 7.3.1: Install a kiosk or bulletin board with Wildlife Area maps, Title 14 regulations, and public safety information.

GOAL 7.4: Educate the public about the value of the natural and cultural history of the Wildlife Area.

TASK 7.4.1: Install and maintain a kiosk or bulletin board with natural and cultural history interpretive material at appropriate public access points.

TASK 7.4.2: Support the use of the BFREC and the MCCWA for environmental education.

8. Structures

No physical structures currently exist on the Cottonwood Creek Unit. BFW1 has several structures in various states of repair. Building structures requiring maintenance and/or renovation include a mobile home, horse shed, pole barn, single family home, two story garage, covered pool house, changing house, and airplane hangar. Other facilities include an irrigation system consisting of a small network of ditches that distribute water to the ponds, wetland habitats, and irrigated pasture. BFW2 has no usable structures. A map of existing structures on BFW1 is provided in the property description of this plan (IID, Figure II-n).

GOAL 8.1: Optimize the use of the existing structures at BFW1 for the Balls Ferry Research and Education Center.

TASK 8.1.1: Maintain the residences, workshop, storage buildings, sheds, and related structures as needed to optimize the efficient use of the operating budget and to ensure the health, safety, and reasonable accommodation of people using the site.

TASK 8.1.2: Identify and prioritize specific facility needs to carry out research, monitoring and education goals for the MCCWA.

TASK 8.1.3: Prepare a hazardous material assessment for asbestos and other toxins within the existing structures.

TASK 8.1.4: Remove facilities that are unsafe or unusable for the research and educational purposes.

TASK 8.1.5: Modify or construct facilities as needed to meet the requirements of the ADA.

9. Equipment

CDFG owns, operates and maintains the following equipment for use at the MCCWA:

- Four-wheel drive, 3/4 ton pickup
- Three point disc
- Three point scraper
- All terrain vehicle (ATV) and trailer
- Riding lawn mower

Land managers have identified the following equipment needs in order to facilitate full implementation of this land management plan:

- 100 horse power wheel tractor
- 12-ft. disc
- 12-ft. mower
- Backhoe
- Broadcast seeder
- Herbicide spray rig
- One-ton dump truck
- Rowboat and life vests

Full details are discussed in the Operations and Maintenance Summary (V).

GOAL 9.1 Manage the grounds at the MCCWA to protect, maintain and improve the biodiversity, habitat integrity and environmental health.

TASK 9.1.1: Purchase equipment needed to maintain grounds and facilities at MCCWA.

GOAL 9.2: Maintain all equipment, vehicles and facilities in optimum working condition to maximize the efficient use of the Wildlife Area's operating budget.

TASK 9.2.1: Regularly inspect and service all heavy equipment and vehicles.

TASK 9.2.2: Regularly inspect and maintain fuel tanks to comply with state and federal law.

TASK 9.1.3: Establish cooperative agreements with Caltrans, WSRCD, and CAL FIRE to provide and operate equipment needed to maintain the grounds and facilities at MCCWA.

GOAL 9.3: Maintain facilities and structures as necessary to promote compatible public uses and provide a unique research and education center for the area.

TASK 9.3.1: Purchase a rowboat and life vests for environmental education and water quality monitoring at the BFREC.

Facility Maintenance Resources

CAL FIRE. CAL FIRE has provided work crews to assist the CDFG with trail maintenance and brush clearing at the MCCWA. This is an economical arrangement benefiting both agencies and should be continued.

Citizen Volunteers. The CDFG's Volunteer Coordination Handbook (2003c) provides guidance for enlisting and working with citizen volunteers. This document is available through the North Coast Region office. A volunteer program may include biological monitoring, trail maintenance, plant restoration, weeding, and exotic plant removal. Using volunteers has been effective for the National Park Service (NPS Volunteers in Parks Program), the Fish and Wildlife Service (USFWS volunteers), and California State Parks (State Volunteers in Parks). Successful implementation of such a program must be carefully balanced with the biological goals and monitoring elements and will require a volunteer coordinator. This position could be associated with the Balls Ferry Research and Education Center (IVE).

Constraints on Facility Maintenance Elements

The goals of the facilities maintenance elements are constrained by a range of natural and human induced factors. Effective management of the Mouth of Cottonwood Creek Wildlife Area requires that these factors be identified and considered.

Environmental factors

Maintenance requirements will depend largely on the severity of winter weather conditions. In years of exceptional rainfall, flooding or erosion may damage roads, fences, and signage. The degree of damage will dictate maintenance priorities.

Legal, political, or social factors

The addition of signing, access improvements, and portable sanitation will result in public expectation for the maintenance of these improvements. Some of the improvements may attract vandalism. The frequency and severity of vandalism may impact the department's ability to maintain the improvements or to continue to provide them over the long term.

Financial factors

As with other elements, limited funding for staff and operations is a major constraint on facilities maintenance. Full realization of the facilities maintenance goals will require an increase in funding for the Wildlife Area.

G. Cultural Resource Element

Human activity at the Mouth of Cottonwood Creek Wildlife Area has been continuous since prehistoric occupation. Significant historical or archaeological resources may be present on all units and could potentially be affected by public uses or management actions, particularly ground-disturbing activities in areas not yet surveyed. Some remnants of human activity may need to be removed or disturbed because of safety hazards, aesthetic impacts, or conflicts with other management goals.

PHOTO: Historical marker of the Rancho Buena Ventura Adobe Site next to the Redding Island information board, just northeast of the Cottonwood Creek Unit.

PHOTO: Artifacts from bygone days on BFW1.

Archaeological and historical resources on the Mouth of Cottonwood Creek Wildlife Area (MCCWA), as elsewhere, are protected under California Public Resource Code Section 21083.2 and California Code of Regulations, Title 14, Chapter 3, Section 15064.5. Whenever an action with potential impacts on cultural resources is contemplated, California Department of Fish and Game (CDFG) staff must follow a standard procedure to evaluate the significance of the resource and to determine whether the potential impact requires mitigation. California Register of Historic Resources (CRHR) serves as a guide to cultural resources when there is a discretionary action subject to the California Environmental Quality Act; it also serves as a guide for management of the MCCWA. The CRHR lists criteria for evaluating the significance of cultural resources and their eligibility for listing in the Register. Adverse effects to cultural resources eligible for listing must be avoided or the effects mitigated.

GOAL 1.1: Preserve all cultural resources that have yielded or have the potential to yield information important to the prehistory or history of the MCCWA, or that otherwise would meet significance criteria according to the CRHR.

TASK 1.1.1: Conduct cultural resource surveys before ground-disturbing activities (e.g., any new construction, levee maintenance, road grading, or extensive ecological restoration). If necessary, conduct pre-construction archaeological testing and data recovery if resources are discovered.

TASK 1.1..2: Provide an archaeological monitor for all earth moving activities.

TASK 1.1.3: Complete and submit site records to the State Historic Preservation Officer to establish eligibility, and submit any culturally significant resources that may be eligible for inclusion in the National Register of Historic Places or the CRHR.

TASK 1.1.4: Maintain internal library of cultural resource reports from the vicinity.

TASK 1.1.5: Develop interpretive materials for the Balls Ferry Research and Education Center that will inform and educate users about the historical importance of this region.

TASK 1.1.6: Coordinate an interpretive program with the Shasta Historical Society and the local Wintu tribal leaders.

GOAL 2.2: Support use of the MCCWA by Native Americans for traditional activities, such as gathering native plant materials for cultural purposes.

Gathering of limited quantities of native plant materials can be compatible with the goals of the Wildlife Area. The tasks listed below are intended to ensure that such uses are authorized only when compatible and when they take place in a manner that minimizes conflicts with other uses.

TASK 2.2.1: Work with native peoples who request access to determine the purpose of and need for access and/or collections within the MCCWA.

TASK 2.2.2: Develop access plans, including standard liability clauses, for issuing permits to native peoples whose activities are compatible with the goals of this plan.

TASK 2.2.3: Allow limited gathering of materials for educational and craft purposes by tribal members.

Constraints on Cultural Resource Protection

Effective management of the Mouth of Cottonwood Creek Wildlife Area requires that potential constraints to implementation of the cultural resource element be identified and considered.

Environmental factors

While cultural resource protection is an important component in the department's mission, protection of habitat and wildlife is the priority.

Financial factors

Limited funding for staff and operations could be a major constraint for the implementation of the Cultural Resource Element. Ground-disturbing activities will require additional cultural resource surveys to ensure protection of sensitive artifacts and resources. This work will require the services of a qualified archaeologist. The cultural resource goals and tasks were formulated under the assumption that the CDFG has or will obtain the funding to undertake these tasks.

H. Resource Coordination Element

The Mouth of Cottonwood Creek Wildlife Area is located within the jurisdictions of many federal, state and local agencies as well as within regional habitat conservation planning areas that were discussed earlier. Agency activities, as well as those of neighbors and lessees, may influence management needs for the Wildlife Area. Improving communication and coordination with these stakeholders is likely to improve outcomes for everyone.

It is the policy of the California Fish and Game Commission that CDFG review and comment on proposed projects affecting important range and habitat values, and to recommend and seek the adoption of proposals necessary or appropriate for the protection of fish and wildlife and their habitats. Coordination with local government and planning agencies is an important component of this policy. Entities that have management activities and interests related to the Wildlife Area include, *but are not limited to*, the following:

Federal and State Agencies

Natural Resources Conservation Service
U.S. Army Corps of Engineers (Cottonwood Creek Mitigation Bank)
U.S. Fish and Wildlife Service (Coleman Fish Hatchery)
U.S. Bureau of Land Management (Reading Island Recreation Area)
CALFED (Ecosystem Restoration Program, Cottonwood Creek Ecological Management Zone)
California Department of Water Resources
California State Water Resources Control Board
California Highway Patrol

Local Governments and Municipalities

Anderson-Cottonwood Irrigation District (easement)
Cottonwood Creek Watershed Fire Safe Council
Shasta County
Shasta County Office of Education
Shasta County Sheriff Department
Tehama County
Tehama County Office of Education
Tehama County Sheriff Department
Western Shasta Resource Conservation District

Utilities

Pacific Gas and Electric Company (easement)

Private Landowners

Neighboring landowners

Tribal Groups

Wintu tribe

GOAL 1.1: Develop regular communication procedures with federal, state and local agencies regarding plans and projects that may affect habitats at MCCWA.

GOAL 1.2: Maintain relationships with adjacent landowners.

TASK 1.2.1: Develop a MCCWA Resource Coordination Plan that identifies key agency stakeholders and establishes a regular communication schedule.

TASK 1.2.2: Establish an online seasonal events calendar and provide generalized reminders to members listed in the contact database.

TASK 1.2.3: Explore the possibility of a MCCWA listserv that includes agency stakeholders as well as regional planning entities (IVC).

TASK 1.2.4: Meet with or send correspondence to adjacent landowners as needed to maintain communication about management needs and activities at the MCCWA.

TASK 1.2.5: Meet with law enforcement staff as appropriate to coordinate activities and explore options for cooperative programs.

TASK 1.2.6: Review, coordinate and provide comments and recommendations on federal, state and local government plans and proposed projects, as appropriate, for the purpose of determining the consistency of such plans with the goals of the Mouth of Cottonwood Creek Wildlife Area Land Management Plan.

Constraints on Resource Coordination

Management coordination involves staff time and resources. Major constraints to the success of this coordination effort include:

- Insufficient staff or funding to identify key outreach entities and individuals, to develop an outreach schedule or strategy, to make contacts, or attend meetings.
- Lack of interest or capacity of outside entities to participate in management.